SIEMENS

Frequency Generator G2021

10 kHz to 25 MHz
with Spectrum Tuning

Instructions for Operation
S45034-G2021-B112-51-7618

SIEMENS AKTIENGESELLSCHAFT

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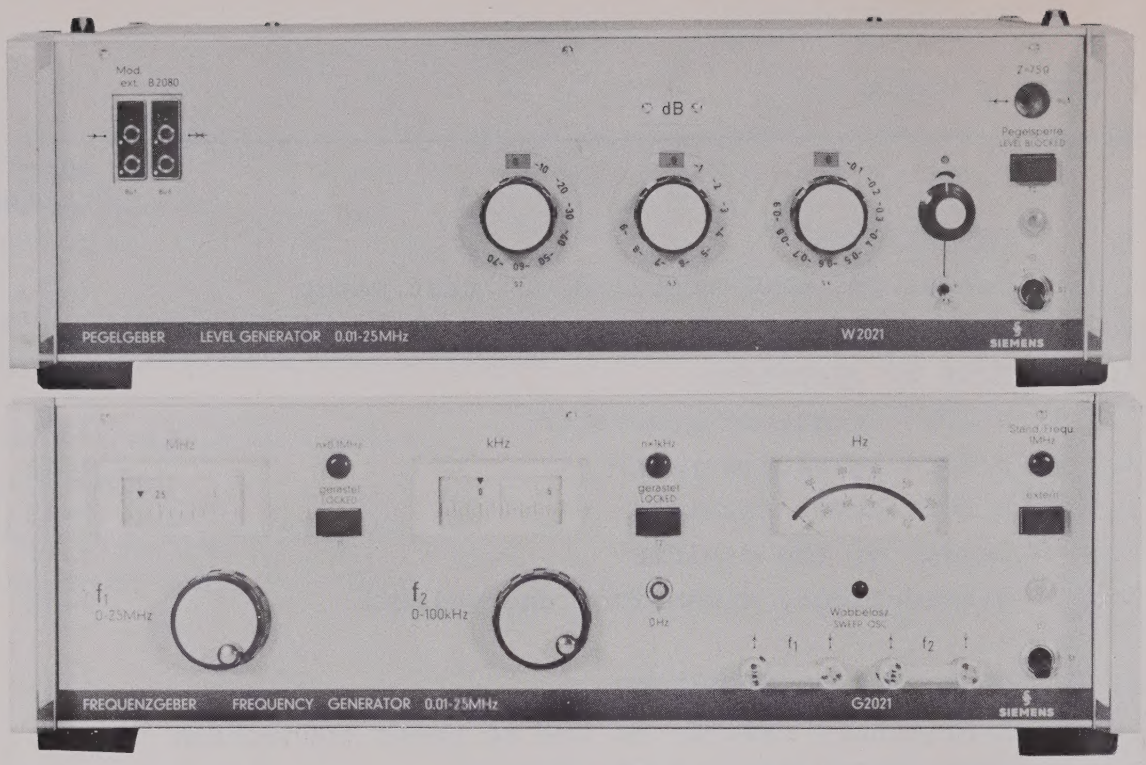
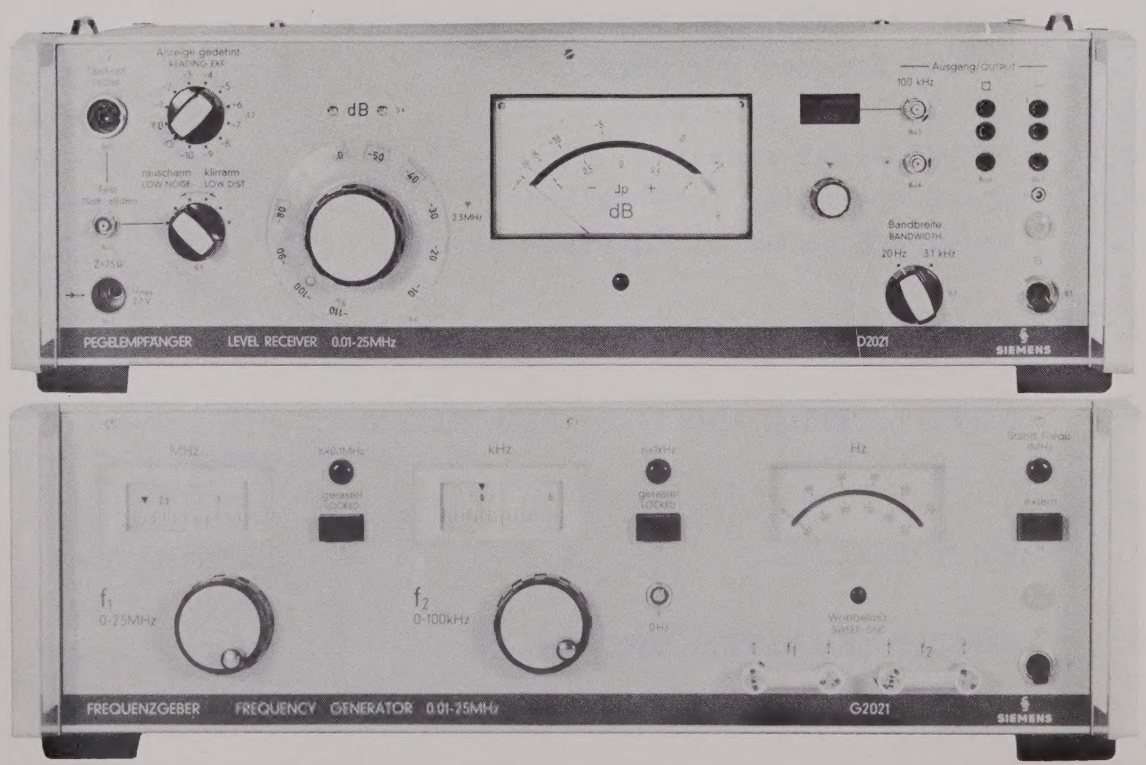


LEVEL OSCILLATOR consisting of: Level generator and Frequency generator



LEVEL METER consisting of: Level receiver and Frequency generator

MEASURING SETUP with two Frequency generators

. DESCRIPTION

.1 USE

High frequency accuracy, superior frequency stability and excellent level accuracy are the prime features of this 25-MHz carrier-frequency test setup. Extending from 10 kHz to 25 MHz, its frequency range covers the transmission bands of, say, 3600-channel communications carrier systems on coaxial lines, including their uppermost carrier frequency, and the basebands of broadband radio relay systems. Supplemented by a plug-in balancing transformer, the test setup can be used equally well for communications systems on balanced lines.

When extended to operate as a sweep test setup, it displays a continuous screen trace with the same accuracy, offering all the advantages of a selective measurement. The swept level receiver is used for frequency analysis, identification of the signal assigned to a band, and detection of interfering frequencies in the multichannel band transmitter.

High frequency stability and accurate frequency setting add to the precision of measurements on steep filter edges in very narrow frequency slots (e.g. pilot measurements), on systems carrying their normal service loads, for continuous supervisions and similar tests without the need for an additional frequency counter in nearly all of these cases.

The signal levels can be adapted to all measurement problems encountered. The resolution of the level indication is increased for any measured value by the activation of a scale-spread device.
The frequency generator, on which the frequency for the test setup is set, is also equipped for use in a sweep test setup.

Used along with the P 2004 phase meter the carrier-frequency test setup is converted into a phase test setup covering the frequency range of 10 kHz to 25 MHz.

G 2021 B
W 2021 B
D 2021 B

The harmonic content of the test signal is suppressed by the receiving end selectivity, so it will not affect the measuring accuracy.

The test setup is composed of individual units (see photos). The W2021 level generator and the G2021 frequency generator from the level oscillator, the D2021 level receiver and the G2021 frequency generator make up the level meter. The same type of frequency generator is used in both combinations. When no more than level oscillator/level receiver frequency synchronization is required, an advantageous arrangement for many attenuation measurements on four-terminal networks, the test setup can be made up of the level generator, the level receiver and one frequency generator.

Measuring setup with one frequency generator
LEVEL RECEIVER D 2021
FREQUENCY GENERATOR G 2021
LEVEL GENERATOR W 2021

1.2 ELECTRICAL SPECIFICATIONS

Temperature range: +5 °C to +40 °C

Level oscillator: W2021 level generator and G2021 frequency generator

Level meter: D2021 level receiver and G2021 frequency generator

G2021 frequency generator

Specifications referred to the level oscillator output and the level meter input

Frequency range ..... 10 kHz to 25 MHz
settable test frequency f_m = ... f_1+f_2

Coarse setting f_1
in 100-kHz spectrum steps ..... 0 to 25 MHz
When the spectrum facilities are disconnected, continuously from ..... 0 to 25 MHz

Fine setting f_2
in 1-kHz spectrum steps ..... -10...+115 kHz
When the spectrum facilities are disconnected, continuously from ..... -10 to +115 kHz
Minimum readable frequency difference in continuous tuning mode ..... 10 Hz

Frequency error
with internal frequency standard
for the 100-kHz and 1-kHz spectrum steps .... $\pm 1 \times 10^{-6}$
(f_1 and f_2 spectrum-locked)
for the intermediate values (f_1 spectrum-locked, f_2 continuously tuned) $\pm 1 \times 10^{-6} \pm 20$ Hz

Standard frequency ..... 1 MHz
from internal frequency standard:
frequency error ..... $\pm 1 \times 10^{-6}$
frequency drift owing to aging ..... $< 2 \times 10^{-7}$/month
control voltage available across 75Ω ... approx. 1 V_{p-p}
from external frequency standard:
required input voltage across 75Ω ..... 0.5 to 5 V_{ss}

Automatic tuning system ..... for f_1 and f_2

Power connection ... 110,117,127,220,227,235V; 47 to 63 Hz; approx. 45 VA
Specifications will be adhered to despite line voltage changes of ..... ±10 %

W2021 level generator

controlled by the G 2021 frequency generator
Calibration referred to: 0 dB corresp.to 0.775 V
0 dBm corresp.to 1 mW

Output level for $R_i = R_a = 75\Omega$ ..... -79.9 to 0 dB
-69.9 to +10 dBm
adjustable with 3 dividers in steps of 10; 1 and 0.1 dB
in addition, continuously variable by Δp approx. +0.15 dB

Output level error at +23 °C
for the reference values
0 dB (+10 dBm) and 2.3 MHz, and $R_i=R_a=75\Omega$ ..... ±0.05 dB
temperature coefficient ..... 0.003 dB/°C
frequency response up to 25 MHz .... ±0.05 dB

Divider error
basic error at 10 kHz ..... ±0.05 dB
frequency response up to 25 MHz ..... ±0.08 dB

Output jack (adaptable to other plugs) ..... coaxial, 4/13

Internal impedance, unbalanced ..... 75 Ω
balanced with plug-in transformer ..... 124, 150 Ω

Reflection coefficient at output Z=75 Ω at
p≤-10 dB,≤0 dBm ..... r<0.02

3rd order or 4th order harmonic margin for
75-Ω termination
10 kHz to 5 MHz ..... >50 dB
up to 25 MHz ..... >40 dB

Spurious radiation ..... >60 dB down

External modulation (AM) with level ..... 0 to approx. 50 %
control (Bu1)
frequency range ..... 30 Hz...30 kHz
modulating voltage required for each
percent of modulation ..... approx.40 mV

Control input for verifications in the case of line
measurements (Bu 5):
Frequency range ..... 0...10 kHz
Level setting range ..... +2 dB...-4 dB
Control current required ..... approx.+500 µA...-450 µA
Input impedance ..... approx. 5.6 kΩ
AC line 110,117,127,220,227,235 V; 47 to 63 Hz; approx.30VA
Specifications will be adhered to despite
line voltage changes of ..... ±10 %

D 2021 level receiver
controlled by the G 2021 frequency generator
Calibration referred to 0 dB corresp.to 0.775V
0 dBm corresp.to 1 mW

Level range (instrument set to zero mark)
can be switched in 10-dB steps ..... -110 to 0 dB
-100 to +10 dBm

Minimum readable level ..... -120 dB
-110 dBm

Scale spread device
built-in for 'low-noise' measurements
level range, can be switched in 10 steps of ..... 1 dB
scale range ..... ±1 dB
minimum readable level difference ..... 0.02 dB

Measuring error for the reference values
0 dB (+10 dBm), 2.3 MHz, and Z=75Ω ..... ±0.1 dB
frequency response up to 20 MHz ..... ±0.1 dB
up to 25 MHz ..... ∓0.2 dB

Error of the input divider (S3 + S6)
basic error at 10 kHz ..... ±0.04 dB
frequency response up to 25 MHz ..... ±0.02 dB
Divider error of the scale-spread device (S2) .... ±0.02 dB

Selectivity ..... depending on IF filter

IF filter	Filter 1	Filter 2	Filter 3	Filter 5	Filter 6
pass band $\Delta a < 0.5$ dB	±4 Hz	±20 Hz	±800 Hz	±650 Hz	±2 kHz
bandwidth $\Delta a = 3$ dB	~20 Hz	~80 Hz	~3.1 kHz	~1.9 kHz	~9 kHz
rms noise bandwidth	-	-	-	1.74 kHz	-
Stop band					
a>55 dB at	-	-	±10 kHz	-	±30 kHz
a>60 dB at	±500 Hz	±500 Hz	-	-	-
a>80 dB+ at	-	-	-	±2 kHz	-
typical use	pilot	pilot	channel/sweeping	noise	sweeping
module	D 5020	D 5021	D 5022-B	D 5026	

The D 2021 level receiver can be equipped with two filter modules:
a) narrow-band filter module: filter 1 or 2 and
b) broadband filter module: filter 3 or filters 5 and 6
Standard equipment: filters 1 and 3

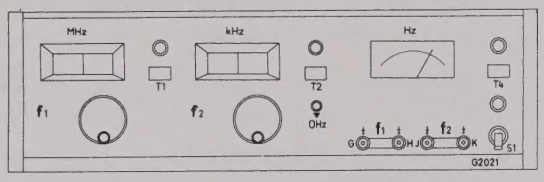
Intermediate frequency
IF1 ..... 44.9 to 45.0 MHz
IF2 ..... 2.4 MHz
IF3 ..... 100 kHz
Voltage attenuation at the input with one of the intermediate frequencies F_{I1}, F_{I2} or F_{I3} ... >70 dB
Image frequency rejection
for f_m+ 2IF1 ..... >70 dB
for f_m+ 2IF2 or f_m+ 2IF3 ..... >80 dB
Inherent noise for a 3.1-kHz bandwidth..<-124 dB, <-115 dBm
S/N ration in the 'low-noise' position and
for a 20-Hz bandwidth ..... >70 dB
3rd order and 4th order harmonic margin in the 'low distortion' position when the sensitivity is increased by 50 dB ..... >70 dB
Input jack (adaptable to other plugs) ..... coaxial, 4/13
Input impedance, unbalanced ..... 75 Ω
with probe ..... high impedance
balanced with plug-in transformer ..... 124, 150 Ω
Return loss at input Z=75 Ω, up to 25 MHz ..... r<0.02
input divider (S6) set to max.sensitivity, f>20 MHz r<0.05
IF output I, e.g. for D 920 logarithmic amplifier
frequency ..... 100 kHz
max. output level, across Z = 600 Ω .. max. approx. 0 dB
internal impedance ..... approx. 75 Ω
dynamic range for input level ..... approx. 100 dB
IF output II, e.g. for D 3015 or D 917 linear amplifier
frequency ..... 100 kHz
output level for zero instrument mark, across Z=75Ω .. 0 dB
internal impedance .....approx. 75 Ω
Earphone output
frequency at +23 °C ..... 2 kHz±100 Hz
temperature coefficient ..... 10 Hz/°C
internal impedance ..... approx.600 Ω
output level for zero instrument mark, across Z=600Ω approx. 0 dB
DC output across R_a >100-kΩ supplied voltage, when the instrument reads 0 dB ..... approx.300 mV
AC line 110,117,127,220,227,235V; 47 to 63 Hz; approx.30 VA
Specifications will be adhered to despite line voltage changes of ..... ±10 %

+) S/N ratio 66 dB

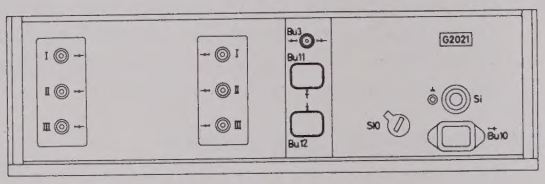
1.3 MODE OF OPERATION

1.3.1 G2021 frequency generator

(See basic circuit diagram S45034-G2021-B712-*-7412)



Rear



Let us start with the frequency conditioning concept to explain the operation of the test setup. Coarse and fine control of the measuring frequency are effected on two oscillators (f_1 and f_2 in the basic circuit diagram). The first oscillator covers a range of 25 MHz (from 45 to 70 MHz), the second one of 125 kHz (from 1.01 to 0.885 MHz). For the sake of clarity, the 10-kHz and 15-kHz overlap on the low and high frequency and respectively has not been shown beyond 100 kHz on the basic circuit diagram. For the same reason, f_2 is dealt with on the basis of a 100 kHz frequency range (from 1.0 to 0.9 MHz).

The f_1 oscillator directly supplies the carrier voltage for frequency conversion in the level generator and level receiver. To give its frequency the stability of a crystal oscillator, it was augmented by a circuit to lock to multiples of a crystal frequency.

As all oscillators of the test setup apply this principle, it will be discussed in more detail below.

An oscillator (G5001) equipped with a crystal oven supplies the 1-MHz standard frequency f_o. A train of pulses with a repetition frequency of 100 kHz is obtained in a succeeding divider stage (G5002). This frequency is compared with the frequency of the oscillator (G5009) in a pulse mixer stage (G5011).

For this purpose, a voltage is tapped from the oscillator output and passed via a buffer amplifier (G5012) to the pulse mixer (G5011). There an instantaneous value is taken from the oscillator voltage at the rate of the 100-kHz spectrum: The amplitudes of the resultant pulses are thus given by the value of the RF voltage at the instant of scanning. If now the oscillator frequency is an exact multiple of the spectrum frequency (100 kHz), the amplitudes of the pulses are also constant. If not, the amplitudes change continuously.

The pulses are amplified and rectified in the succeeding circuit. The resultant spectrum is filtered by a low pass. The output voltage is passed to the oscillator varactor as a control voltage. Thus, when the oscillator is synchronized, this voltage is a dc voltage and when the oscillator is not, it is an ac voltage whose frequency corresponds to the difference between the oscillator frequency and the next spectral line of the 100-kHz spectrum. Since the low-pass filter suppresses the higher frequencies, the frequency of the varactor control voltage is always lower than 50 kHz.

This ac voltage sweeps the (unsynchronized) oscillator. If the oscillator is retuned by hand so that its frequency approaches a spectral line, the sweeping action ensures that the frequency actually reaches the spectral line. The output voltage of the phase bridge whose frequency has steadily decreased in the course of the tuning process rapidly becomes a dc voltage. It adjusts itself automatically so that the oscillator frequency coincides exactly with the spectral line. Its value is

dependent only on the phase between the two.

The regulating condition represents a 'stable balance'. If the tuning is changed - owing to a slight change of the variable capacitor setting or to temperature changes - the varactor readjusts automatically so that the oscillator frequency is maintained. The output voltage of the phase bridge then necessarily assumes a different value.

The holding range is wide enough for the oscillator not to drift out of lock owing to temperature or time factors. The oscillator can, of course, be operated free-running as well (button T1); in which case the phase bridge is disconnected and the varactor is fed with a constant voltage.

Lock-in indication

The locking of the oscillator frequency to the spectrum frequency is indicated. As soon as synchronization is achieved, the phase bridge supplies a dc voltage only. The lock-in indication relay operates and the associated lamp lights up. In addition to the visual indication, the 'click' of the relay facilitates setting of the transmit frequency.

However, if the lock-in mode is selected and the oscillator is not locked, the ac voltage furnished by the phase bridge disables the indication circuit, and the lock-in indication lamp fails to light up.

The frequency position of the f_2 oscillator (G5015) is about 1 MHz and its locking pattern is based on multiples of 1 kHz. The pulse sequence of 1 kHz is taken from the 100-kHz spectrum (G5002) through an additional 100:1 divider circuit and applied to a phase discriminator (G5016) in the same way as for the synchronization of f_1. Synchronization is likewise indicated by a relay and a lamp. In free-running operation, equally selectable with a pushbutton (T2), the difference frequency to the

adjacent spectral line is applied to a counting discriminator (G5016) and the time integral of the resultant current pulses is indicated by a moving-coil meter. The meter current is proportional to the difference frequency and reaches its highest value at 500 Hz. The intermediate values of the 1-kHz spectrum can be interpolated in a simple way with the aid of this meter indication, too. The frequency scale can be checked for complete agreement with the present frequency by reference to the meter indication and recalibrated with the potentiometer '0 Hz' (P1), if required.

The f_2 frequency is conditioned into a control frequency for the level generator and the level receiver via a frequency converter (G5017). A regulating circuit and an additional oscillator (G5018) keep this control frequency free from spurious emissions. By way of a phase discriminator (G5019) and a varactor, the f_3 frequency of this oscillator, covering the range 42.6 to 42.5 MHz, is always set to the sum of the frequencies of the 41.6-MHz crystal oscillator (G5021) and the variable interpolation oscillator spanning the frequency range 1.0 to 0.9 MHz. The crystal oscillator is itself synchronized with the 100-kHz spectrum.

The carrier voltage of frequency f_1 and the control voltage of frequency f_3 are applied to the main modulator of the level generator after a further frequency conversion in the level generator. The level receiver receives the control voltage of the frequency f_1 as carrier voltage for the first mixer stage and the control voltage of frequency f_3 as carrier voltage for the second mixer stage. Since a synchronization of the variation of the oscillator and receiver control frequencies is of advantage in many cases, these frequencies are generated in a single unit, i.e. the frequency generator as mentioned before. The control voltages of frequencies f_1 and f_3 as well as the 100-kHz pulse spectrum are taken from the frequency generator

without any reaction via buffer stages (G5003, consisting of G5006 and G5007). The 1-MHz standard frequency of the crystal-oven oscillator (G5001) is either brought out or can be applied to the frequency generator by an external standard generator. The applied standard frequency voltage is indicated by a lamp.

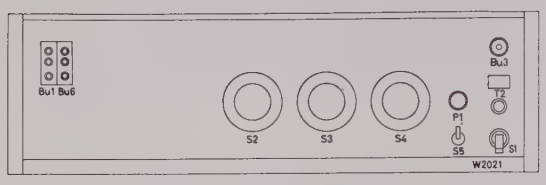
The frequencies of the f_1 and f_2 oscillators are set with reference to film drives with 1-m long frequency scales whose frequency markers are individually calibrated by an electronic flash device.

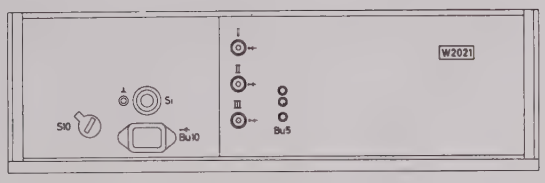
The internal oscillators for the f_1 and f_2 frequencies can be replaced by external sweep oscillators. The front panel jacks pairs G-H and J-K are provided for this purpose.

Synchronization of the control frequencies when <u>two</u> frequency generators are used is accomplished by using only <u>one</u> standard generator (f_o = 1 MHz) for both frequency generators.

1.3.2 W2021 level generator

(See basic circuit diagram S45034-W2021-B112-*-7412)





The signal with the level generator output frequency 0 to 25 MHz is obtained in the main modulator (W5009) as a difference voltage between the frequencies f_1 (45 to 70 MHz) and f_5 (45 to 44.9 MHz) of an auxiliary oscillator (W5006) controlled by f_3 (42.6 to 42.5 MHz). The f_5 frequency is produced in an oscillator (W5004) retuned by a varactor. It is the sum of the variable f_3 frequency and an oscillator frequency of 2.4 MHz (W5001) synchronized with the spectral frequency of the 100-kHz spectrum. The f_3 control frequency supplied by the W2021 frequency generator is passed via a W5021 buffer amplifier, which prevents any reaction particularly to the receiving section.

The output signal of the W5004 oscillator is applied to the W5009 main modulator as a control voltage via an additional modulator (W5008) acting as a controller for the regulation of the output level.

For this purpose, a voltage is taken from the broadband amplifier, rectified and compared without any drift with a voltage stabilized by a zener diode. The amplified difference voltage influences the control voltage of the main modulator via the W5008 controller and thus stabilizes the output level of the broadband amplifier.

The applied and stabilized voltage can be varied within narrow limits with a divider (W5017) thus enabling the output level to be finely set (9 x 0.1 dB).
The output voltage can be amplitude-modulated via the jack 'external mod.' (Bu1) without varying the control and the fine setting of the level.

After disabling the level control, the output signal can be controlled with a dc voltage via a further input (Bu5). When route measurements are made this input is also used for sending the measured values back to the transmitting station.

The W5009 main modulator receives its control voltage from the W5008 modulator with the frequency f_5 = 45 to 44.9 MHz and its carrier voltage from the G2021 frequency generator with the frequency f_1 = 45 to 70 MHz. The latter is fed via a buffer amplifier (W5020) to avoid reaction. The output signal covering the frequency range 0 to 25 MHz passes through a low-pass filter before being applied to the broadband amplifier.
The W5011 broadband amplifier raises the signal level to the nominal level of 0 dB or +10 dBm at an internal impedance of 75 Ω. In the case of internal level control the emf is held constant at this point.

The wanted output level is set in steps of 10 dB and 1 dB via voltage dividers in the signal path. These dividers (D5052 and 5051) are highly accurate, integrated attenuators.

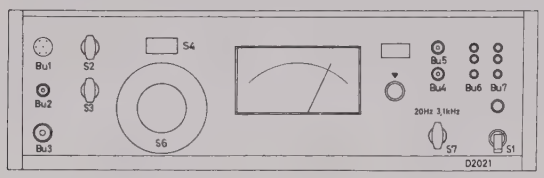
The output level is finely set in steps of 0.1 dB with a variable resistive divider (W5017) in the regulating path, and continuously with a potentiometer (p1), which can be activated with switch S5, if required.

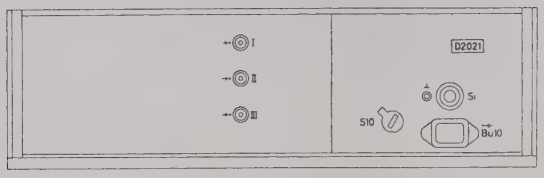
Conversion from power level calibration to voltage level calibration is effected by varying the reference voltage by 0.97 dB (resoldering a link in the W5008 modulator) and shifting the attenuation range by 10 dB at the same time (change the scale of the attenuator and the 'dB' or 'dBm' plate.

For connecting a frequency counter a jack isolated from the measuring signal output can be added later at the rear of the level generator.

1.3.3 D2021 level receiver

(See the basic circuit diagram S45034-D2021-B112-*-7412)





The D2021 is a multiple-conversion superheterodyne receiver with three intermediate frequencies. The measuring level reaches the first modulator (D5006) via an input divider (D2052), which can be varied in steps of 10 dB, and a low-pass filter (D5003). The first modulator converts the input signal into the first IF of 45.0 to 44.9 MHz. The frequency generator control signal of frequency f_1 (45 to 70 MHz) is fed into the first modulator as a carrier, and its amplitude is held constant by an AGC amplifier (D5007). This arrangement ensures that the measurement result is not affected by fluctuations of the local oscillator voltage.

After feeding the interpolation oscillator control signal of frequency f_3 into the second modulator (D5009) the measuring signal is translated to the second IF of 2.4 MHz. IF filters (D5010, D5011) are included in the signal path to suppress the image-frequency signals. A superheterodyne oscillator of 2.3 MHz (D5012), whose output signal, after being stabilized, is also used as a calibrating voltage effects the translation of the measuring signal to the third IF of 100 kHz in the third modulator. Most of the amplification and selectivity provided by the receiver is accomplished at this frequency

position. The superheterodyne receiver (D5013) is synchronized with a spectral frequency of the 100-kHz spectrum via a phase bridge (D5014).

As the amplification between the receiver input and the main selectivity filter is kept very low, a wide dynamic range is obtained, which is of advantage in measurements where receiver linearity is the prime consideration. The level receiver selectivity is determined by the IF filter used. Several IF filters are available for optimum matching of the level receiver to the different measurement problems. Alternatively, one of two crystal filters with 3-dB bandwidths of 20 Hz and 80 Hz respectively (D5020/5021) can be used in addition to a coil-filter module, i.e. either the D5022 module with a filter of a 3-dB bandwidth of 3.1 kHz or the D5026 module with filters of a 3-dB bandwidth of 1.9 kHz or 9 kHz.

The narrow-band crystal filters are used for selective (static) measurements on discrete frequencies, such as pilot levels in carrier systems, while the broadband coil filters are used for sweep measurements, for measurements over the bandwidth of a channel and for measuring the noise level in the recommended rms noise bandwidth of 1.74 kHz (3-dB bandwidth 1.9 kHz).
The desired built-in filter can be selected with the rotary switch S7.

Level correcting and controlling networks are incorporated in the signal amplification path. These include a 10 x 1 dB divider for controlling the level-spread indication and a 4 x 10 dB attenuator for optimum matching of the signal gain to low-noise or low-distortion measurements (D5018).
These dividers employ precision transformers of high dividing accuracy. The switch from voltage level to power level is also made on the front panel. However, for correcting the sensitivity, the input divider dial must be exchanged.

For calibrating the gain with the aid of the internal calibrating level of -60 dBm or -70 dB at 2.3 MHz the receiver also contains a calibrating potentiometer settable on the front panel.

More than 90 dB of gain is introduced between the input of the third IF amplifier (D5015) and the detector for indicating the measured value (D5019). After detection, which reflects the rms value of the signal to comply with the requirements of noise level measurements, the level under test is indicated on a large, easy-to-read moving-coil meter whose second scale is also graduated for the spread-level indication. This scale spread is activated with switch S2 and the additional dc gain required is introduced between the detector and the meter (D5018). Thus, level difference of as little as 0.02 dB can be clearly read.

Several outputs are provided in the level receiver for the further processing of the measurement results:

IF output I: (Bu 4) The full dynamic range of the input circuit is still available directly after the IF filters in the IF range of 100 kHz. Its low gain is offset with an attenuator so that the output level is equal to the input level*. The level switch remains in the marked position (red dot) regardless of the input level. The gain path after the IF filter is interrupted, the meter pointer is at the symbol ∞. Level differences of as much as 100 dB or so are correctly indicated. A succeeding D2001 level tracer with the D920 logarithmic amplifier displays a filter curve with an attenuation/frequency response of 100 dB in one trace.

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* Calibration in dB: 0 dB at the input (75 Ω) results in 0 dB at the output (600 Ω) (which corresp. to 0 dB)

Calibration in dBm: 0 dBm at the input (75 Ω) results in 0 dBm at the output (600 Ω) (which corresp. to 0 dB)

IF output II: (Bu 5) Ahead of the detection and indication circuit the signal in the IF range of 100 kHz is branched to output jack Bu 5 via a buffer amplifier.

The gain in the IF range is reduced by 10 dB via a jack contact (Bu5) to improve the S/N ratio.

The output voltage is proportional to the meter deflection and amounts to 0 dB across the 75-Ω termination when the meter reads 0 dB. The D2001 level tracer with the D918 or D917 linear amplifier displays a high-resolution trace: A level difference of 0.1 dB results in a deflection change of approx. 15 mm.

The test signal is made audible via the 'earphone output'. In a modulator (in D5019), whose carrier voltage of 102 kHz is furnished by a separate oscillator, the 100-kHz IF signal is translated to the audible range and brought out at the jacks Bu6. The bandwidth is dependent on the IF filter used.

The high frequency setting accuracy of the test setup makes a specific channel easy to select from the broad transmission band for monitoring the noise with an earphone.

The 'recorder output' (Bu7) supplies a dc voltage proportional to the meter deflection. With a high-impedance load, such as a UNIREG S line recorder, a voltage of approx. 300 mV is supplied when the meter reads 0 dB. The output can also be used to connect a printer.

For measurements that require no power to be drawn from the circuit under test it is possible to use a probe of high input impedance. This probe is powered via a terminal on the front of the receiver. If connected to test jack Bu2, the probe is included in the level calibration.

1.4 LAYOUT OF THE DEVICES

The devices are constructed in the Siemens UNIMES style, which is based on a profile-bar frame. The dimensions correspond to the 19-inch standard. The devices can be easily mounted in either DIN standard 41490 racks or 19-inch racks (DIN standard 41494) with the aid of brackets supplied upon request.

The plug-ins are accessible and easy to exchange when the side covers have been removed. The plug-ins carry the circuitry; all active elements are silicon transistors.

Maintenance of the devices is extremely simple despite the large number of individual modules as the input and output signals of all properly working modules have well-defined and often identical values. All carrier voltages for instance, are applied to the converters with a power level of 0 dBm into 75 Ω (which corresponds to a voltage level of -9.03 dB).

Deviations from the nominal values can thus be rapidly detected and defective modules replaced without loss of time.

1.5 DESIGNATIONS, DIMENSIONS AND WEIGHTS

Item	Order No.	Dimensions in mm	Approx. weight kg
W2021 level generator			
10 kHz to 25 MHz			
Model -79.9 to 0 dB	S45034-W2021-B112	448x150x445	15
Model -69.9 to +10 dBm	S45034-W2021-B212	448x150x445	15
Accessories			
3 coaxial cables	V42251-C111-A104	250	0.2
1 power cable	V45258-R3001-A1	325	0.2
1 RF connector 1.6/5.6	C42334-A75-A2		
3 clamps	C44165-A24-B131	25x25x20	0.1
6 indicating lamps 12 V (2 spares)	Fg lp 62 b		
3 G fuse links (2 spares)			
M 0.4 C DIN standard 41571 for 220 V	D41571-M400-C2		
M 0.8 C DIN standard 41571 for 110 V	D41571-M800-C2		
G2021 frequency generator			
10 kHz to 25 MHz	S45034-G2021-B712	448x150x445	20
Accessories			
2 coaxial cables	V42251-C111-A101	1000	0.2
1 power cable	V45594-F4-A222	1500	0.3
3 clamps	C44165-A24-B131	25x25x20	
6 indicating lamps 12 V (2 spares)	Fg lp 62 bf		
3 G fuse links (2 spares)			
M 0.4 C DIN standard 41571 for 220 V	D41571-M400-C2		
M 0.8 C DIN standard 41571 for 110 V	D41571-M800-C2		
D2021 level receiver			
10 kHz to 25 MHz			
Model -110 to 0 dB	S45034-D2021-B112	448x150x445	15
Model -100 to +10 dBm	S45034-D2021-B212	448x150x445	15
Accessories			
3 coaxial cables	V42251-C111-A104	250	0.2
1 power cable	V45258-R3001-A1	325	0.2
1 RF connector 1.6/5.6	C42334-A75-A2		
3 clamps	C44165-A24-B131	25x25x20	0.1
9 indicating lamps 12 V (2 spares)	Fg lp 62 bf		
3 G fuse links (2 spares)			
M 0.4 C DIN standard 41571 for 220 V	D41571-M400-C2		
M 0.8 C DIN standard 41571 for 110 V	D41571-M800-C2		

Item	Order No.	Dimensions in mm	Approx. weight kg
Optional			
Coaxial cable	C42251-C113-A101	500	0.2
Coaxial cable	C42251-C113-A102	100	0.2
Connector insets for input and output	jack 2.5/6, 1.6/5.6, BNC, LEMO		
Suppressor network	S45034-B2079-A702	50x10	0.1
Balancing transformer (up to 1600 kHz)	S45034-B2077-A702		
Probe 10 kHz to 60 MHz	S45034-B2023-A702	150x15Ø	0.2
Probe 6 kHz to 20 MHz	S45034-B2015-C702	150x28Ø	0.3
Preamplifier 50 kHz to 100 MHz, 20 dB	S45034-B2024-A102	127x163x63	1
For swept-frequency operation			
Sweep attachment	S45034-G2022-A702	448x195x357	9
Sweep oscillator I	S45034-G2023-A702	210x136x256	3
Sweep oscillator II	S45034-G2024-A702	210x136x256	3
D2001 level tracer	S45034-D2001-A702	556x394x517	35
Line recorder UNIREG S with dc plug-in	M424-A5 M426-A20	283-190x350	8
D2010 digital level meter Type 4 H 1 noise pulse counter D2066 level standard P2004 phase meter	see data sheets		
Modification parts for racks (one set per device)			
ASA rack (19 inch)	C44165-A25-D252		
DIN standard rack (520 mm front panel width)	C44165-A25-D262		

2. OPERATING INSTRUCTIONS

2.0 PRELIMINARY REMARKS ON THE AC POWER CONNECTION

The devices are designed for operation on ac lines and can be adjusted to different line voltages by means of the voltage selector. The devices are factory-adjusted to a line voltage of 220 V. Before starting to work with the devices, ensure that the line voltage selector is set to the correct local voltage.

If required, set the line voltage selector S10 to the relevant value (110, 117, 127 and 220, 227, 235 V). The fuse rating should be 0.8 amp for the lower voltage group and 0.4 amp for the upper group. Spare fuses are contained in a spare parts bag inside the device. The bag is accessible when the upper cover has been removed.

In line with the safety regulations of the Association of German Electrical Engineers (VDE) the devices are fitted with a protective conductor. For this reason, they have a power cable with a protective conductor and a protective-contact connector (three-wire safety connector) which must be plugged into a socket with protective ground (three-wire safety socket).

If the three-wire safety connector is to be replaced by a locally used one, connect the yellow-green, blue and brown wires of the power cable as follows:

yellow-green wire to the protective conductor terminal,
blue and brown wires to the current-carrying terminals.

Polarized plug systems in line systems with phase and neutral wires:

yellow-green wire to the protective conductor terminal,
blue wire to the neutral wire terminal,
brown wire to the 'phase' terminal.

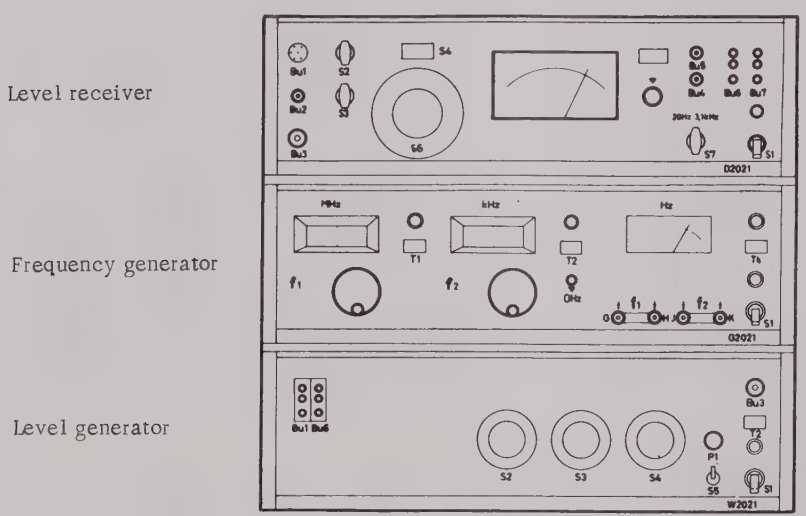
2.1 W2021/D2021/G2021 TEST SETUP

2.1.1 Setup 1 (with one frequency generator)

The transmit and receive sections form a unit. The level generator and the level receiver are fed from the same frequency generator and operated in the synchronized mode.

We recommend stacking the three devices as shown in Fig.1. They can be bolted together with the clamps supplied with each device. Four clamps hold two devices together.

Fig. 1: Front view of the test setup



2.1.1.1 Interconnecting the devices

For establishing an operational test setup the individual devices must be electrically interconnected at the rear. This is done by interconnecting the identically marked coaxial jacks of the level generator and frequency generator on the one hand, and of the level receiver and frequency generator, on the other hand, with six 250 mm long coaxial cables (I to I, II to II, III to III).

Jack I f_1 (45 to 70 MHz)
II 100-kHz spectrum
III f_3 (42.6 to 42.5 MHz)

Fig. 2: Rear view of the test setup with cables plugged

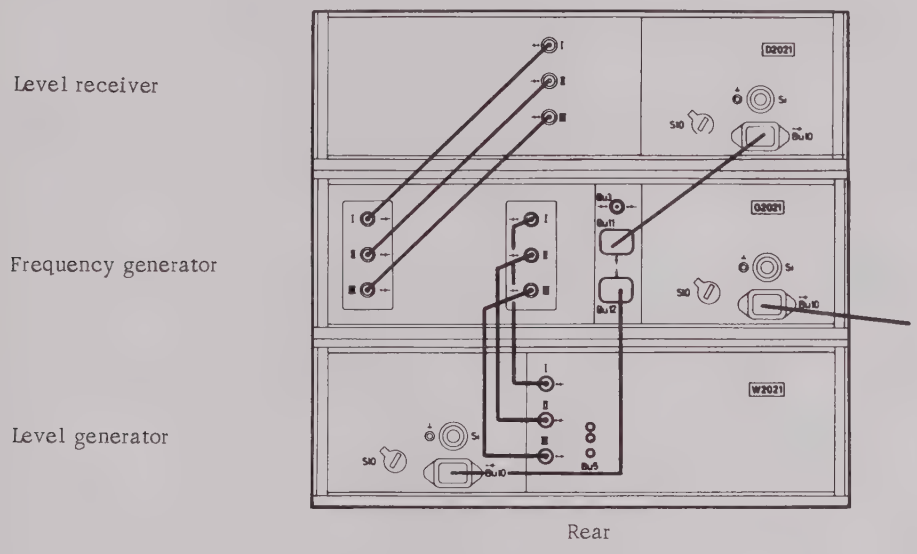


Fig. 2 Rear view of the test setup (cables plugged in)

2.1.1.2 Power connection

The power connection is made as shown in Fig. 2. The line voltage appears at Bu11 and Bu12 of the frequency generator regardless of the position of the line voltage selector. The line voltage selector in each device must therefore be set to the local voltage value and a correspondingly rated fuse must be inserted, see 2.0.

Each device can also be connected individually to the power line.

2.1.1.3 Switching on

The test setup is ready for operation when the power cables have been plugged in and the devices switched on (switch S1).

2.1.1.4 Setting the frequency

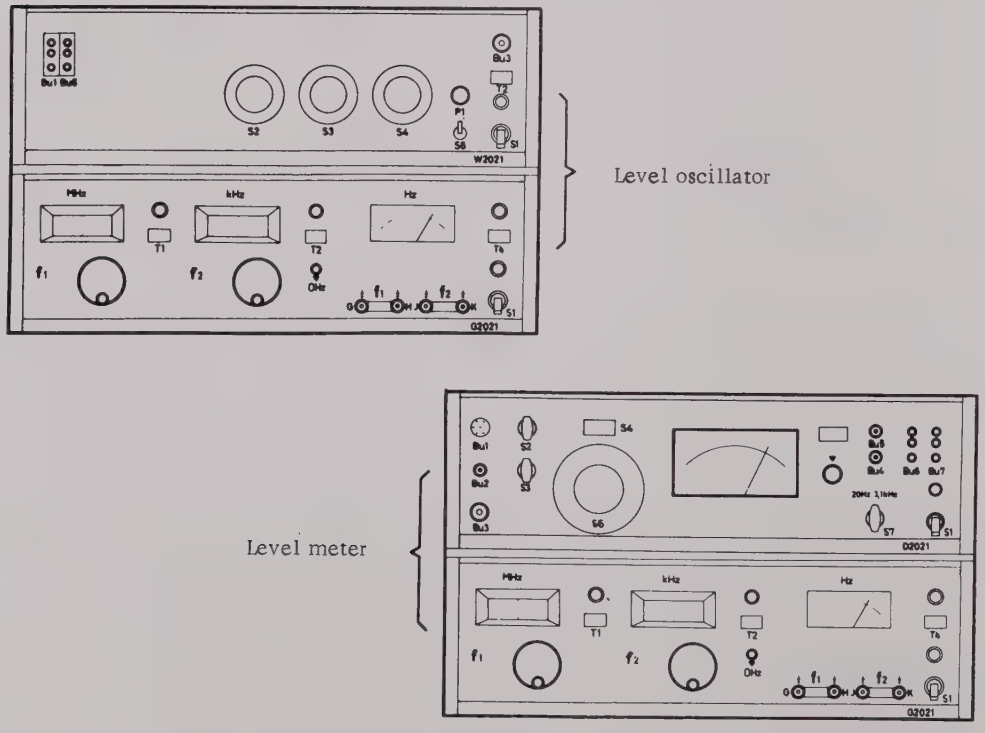
The frequency is simultaneously set for the level generator and level receiver on the common frequency generator.

2.1.2 Setup 2 (with two frequency generators)

The level generator and the frequency generator form the level oscillator, the level receiver and the frequency generator form the level meter.

This setup enables the transmit and receive sections to be installed at different locations as shown in Fig. 3. It also allows measurements at different transmit and receive frequencies.

Fig. 3: Front view of the test setup



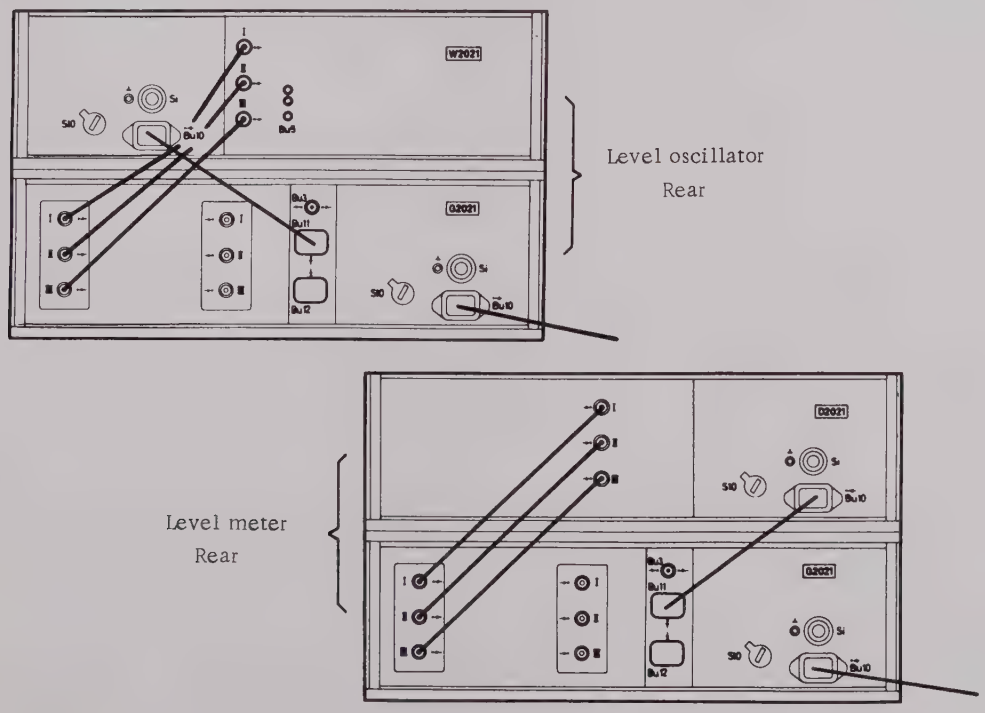
The level generator and frequency generator as well as the level receiver and frequency generator can be bolted together with the clamps supplied with each device (4 clamps for 2 devices in each case), to establish rugged units.

2.1.2.1 Interconnecting the devices

For establishing the level oscillator and the level meter the individual devices are electrically interconnected at the rear. This is done by interconnecting the identically marked coaxial jacks of the level generator and the frequency generator with three 250 mm long coaxial cables (which gives the level oscillator) and by interconnecting the level receiver and the frequency generator (which gives the level meter) likewise with three 250 mm long coaxial cables (I with I, II with II, III with III).

Jack	I	f_1 (45 to 70 MHz)
	II	100-kHz spectrum
	III	f_3 (42.6 to 42.5 MHz)

Fig. 4: Rear view of the test setup with the cables plugged



2.1.2.2 Power connection

The power connection is made as shown in Fig. 4. The line voltage appears at Bu11 and Bu12 of the frequency generator regardless of the position of the line voltage selector. The line voltage selector in each device must therefore be set to the local voltage value and a correspondingly rated fuse must be inserted, see 2.0.

Each device can also be connected individually to the power line.

2.1.2.3 Switching on

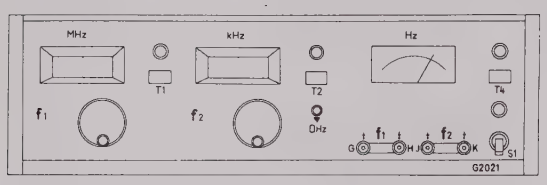
The test setup is ready for operation when the power cables have been plugged in and the devices switched on (switch S1).

2.1.2.4 Setting the frequency

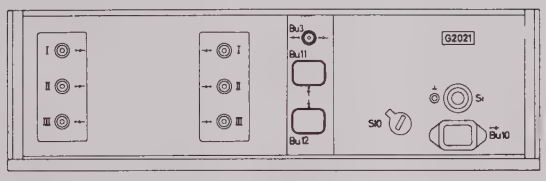
The frequency is set on the frequency generators assigned to the level generator and the level receiver. In synchronized operation (setup 1) it is set on a frequency generator common to the transmit and receive sections.

2.2 G2021 FREQUENCY GENERATOR

Fig. 5



Rear



2.2.1 1-MHz standard frequency

The position of button 'T4' in conjunction with the lamp arranged above it indicates whether the internal 1-MHz oscillator is activated and in operation or whether an external 1-MHz oscillator is feeding a 1-MHz signal into jack 'Bu3'. The brilliance of the lamp is a measure of the amplitude of the 1-MHz signal.

2.2.1.1 Internal 1-MHz signal

Button 'T4' must be released and the lamp above it must light up. This indicates that the internal 1-MHz oscillator is operating.

2.2.1.2 External 1-MHz signal

Button 'T4' must be pushed and an external 1-MHz oscillator with an output voltage between 1 and 5 V_{p-p} for Z 75 Ω must be connected to the 1-MHz jack 'Bu3' on the rear panel. If the voltage of this external

oscillator is sufficient for operating the G2021 frequency generator, the lamp arranged above 'T4' lights up. The brilliance of the lamp is a measure of the magnitude of the level of the external 1-MHz oscillator signal (compare with the internal 1-MHz signal).

2.2.2 Setting the frequency

The wanted test frequency for the test setup or for the level meter and level oscillator is set on the frequency generator. It has a coarse control f_1, covering the full range of 0 to 25 MHz, and a fine control f_2 with an additional expanded indication on the meter.
The set frequency is the sum of the readings of the scales f_1 and f_2 and the meter.

2.2.2.1 Coarse control f_1

The f_1 frequency is set either continuously or in 100-kHz spectrum steps from 0 to 25 MHz with the crank knob 'f_1' and read from the associated scale. For locked operation push button 'T1' and set 'f_1' so that the lamp above the button lights up. The oscillator is thus locked to a frequency of the n x 100 kHz crystal spectrum.

2.2.2.2 Fine control f_2

The frequency is set either continuously or in 1-kHz spectrum steps from 0 to 100 kHz (with an overlap at both ends of the film scale, -10 to +115 kHz) with the crank knob 'f_2' and read from the scale.

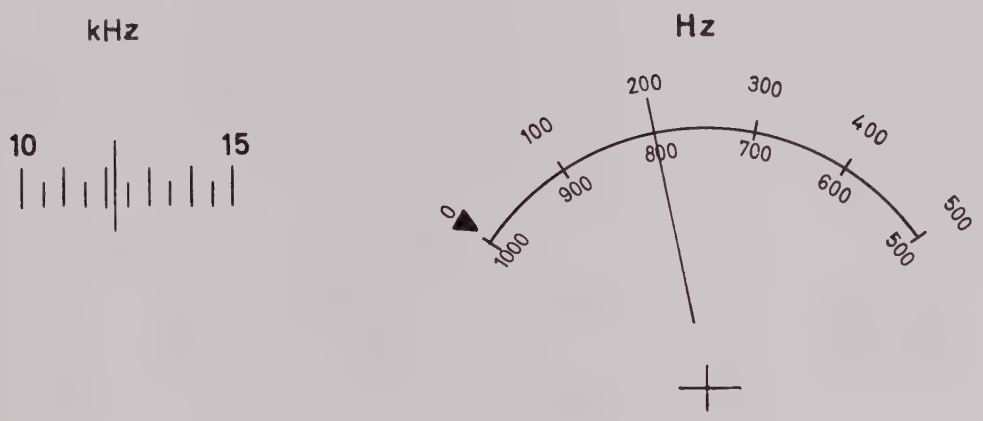
For locked operation push button 'T2' and set the frequency so that the lamp above the button lights up. The oscillator is thus locked to a frequency of the n x 1 kHz crystal spectrum.

In the continuous mode of 'f_2' (button 'T2'released) the meter is in circuit for fine readings. It indicates the

values between the 1-kHz lines of the f_2 scale in the expanded mode.

Fig. 6

Example: 12.2 kHz



f2 Scale Meter

If the meter pointer moves in the same direction as the f_2 fine drive is rotated, take the reading from the upper meter scale (0 to 500 Hz). If the pointer moves in the opposite direction, read from the lower scale (1000 to 500 Hz).

f_2 drive	Meter	Scale
↷	↷	upper (0 to 500 Hz)
↶	↶	upper (0 to 500 Hz)
↷	↶	lower (1000 to 500 Hz)
↶	↷	lower (1000 to 500 Hz)

2.2.2.3 Reading the frequency

The set frequency is read

1) from the scales f_1 and f_2 when f_1 and f_2 are locked
2) from the scales f_1 and f_2 and the meter scale when f_1 is locked while f_2 is set in the continuous mode.

2.2.3 Calibrating f_2

In the continuous mode it is possible to calibrate 'f_2' at 0 Hz, i.e. the zero mark of the film scale can be made to coincide with the meter indication.
To do this: release button 'T2' and set the film scale to 0 kHz. If the meter pointer does not coincide with the calibrating mark (0 Hz) of the meter scale adjust it with the potentiometer '0 Hz'. (Position of f_1 not important.)

As the oscillator frequency approaches the nominal frequency the lamp flashes at the rate of the difference frequency and lights continuously when the difference is less than about 3 Hz.

To check the calibration, set f_1 in the locked mode and f_2 in the free-running mode to '0'; the pointer of the level generator meter must be at the left end, that of the level receiver meter (20 Hz or 80 Hz bandwidth) at the right end.

2.2.4 Synchronization

In setup 1 (with one frequency generator) the level oscillator and the level meter are fully synchronized via the connections of jacks I, II and III. In setup 2 (with two frequency generators) the same circuit configuration can be used for synchronization: connect the two sets of jacks I, II, III from one frequency generator to the level generator and the level receiver.

In operation with 2 frequency generators and separate tuning of transmit and receive sections, we recommend to eliminate the mutual deviation of the internal 1-MHz standard frequencies particularly when measurements are performed with a narrow-band IF filter (20 Hz bandwidth). For this purpose, it is of advantage to use only one standard frequency for conditioning the frequency of the

two frequency generators:
Interconnect the jacks Bu 3 of the two frequency generators, switch button T4 in one generator to 'internal' (released) and in the other to 'external' (pushed). (See 2.2.1).

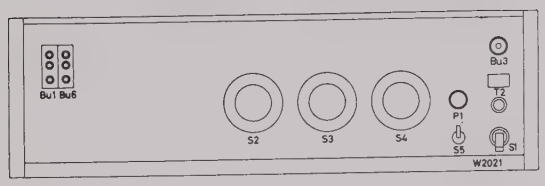
2.2.5 Sweep terminals

4 coaxial jacks are arranged below the instrument. In normal operation the jacks 'G' and'H' are interconnected, while jacks 'J' and 'K' are permanently interconnected by links. These jacks are intended for use in swept-frequency operation. The jacks of the slide-in units of the sweep attachment are identically marked.

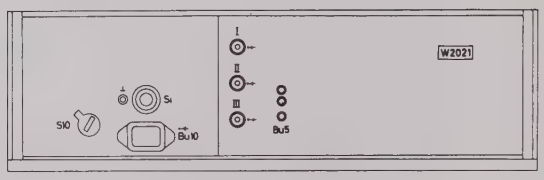
Jack G	Output of f_1 oscillator
H	Input to f_1 sweep oscillator
J	Output of f_2 oscillator
K	Input to f_2 sweep oscillator

2.3 W2021 LEVEL GENERATOR

Fig. 7



Rear



2.3.1 Setting the level

When the level generator is connected to the frequency generator as required for a particular test setup and the desired frequency is set on the frequency generator, the output level at jack 'Bu3' can be set with the attenuators 'S2' in steps of 10 dB, with 'S3' in steps of 1 dB and with the voltage divider 'S4' in steps of 0.1 dB. The switches 'S2, 3, 4' read level values, the level setting (across Z = 75 Ω) can be read directly. The maximum output level at 'Bu3' is +10 dBm or 0 dB, the minimum level -69.9 dBm or -79.9 dB across Z = 75 Ω. The fine control P1, used for additionally varying the output level continuously by p = 0 to approx. +0.15 dB, is actuated with switch S5.

2.3.2 Level suppression

The set level at the output jack 'Bu3' is suppressed by pushing button 'T2'.

2.3.3 External modulation

Input jack Bu1

The level generator can be modulated when an external modulation voltage is applied to jack Bu1.
The level control is maintained.
For permissible amplitude and frequency values refer to the specifications.
Input jack Bu5 (at the rear)
For sending the measured values back to the transmitting station when route measurements are made, the level generator can be modulated via jack Bu5. The level control is then disabled.
For permissible amplitude and frequency values refer to the specifications.

2.3.4 Power level - voltage level

The W2021 level generator can be calibrated either in 'dB' or 'dBm'. This is done by resoldering a link in the W5008 modulator module and exchanging the dial of the level switch S2 and the 'dB' or 'dBm' plate.

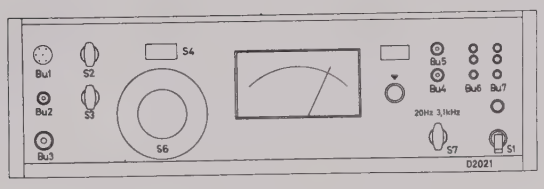
The required second dial and plate (in the spare parts bag) are inside the unit and are accessible when the upper cover panel has been removed.

2.3.5 Increasing the harmonic margin

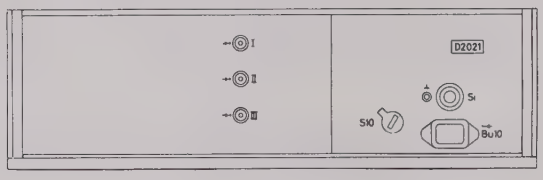
The harmonic margin given in the specifications for f $\leq$ 20 kHz can be further improved by inserting a 4-mm banana plug into the a-jack of Bu1 (external mod.). The time constant in the regulating circuit is then increased by the contact behind the a-jack.

2.4 D2021 LEVEL RECEIVER

Fig. 8



Rear



2.4.1 Power level - voltage level

To change from one level calibration to the other, set switch S4 to the relevant position - after removing the lettering plate - and exchange the dial as well as the lettering plate of input divider S6.
The second dial and the 'dB' or 'dBm' plate (in the spare parts bag) are contained in the unit next to the power section.

2.4.2 Selecting the bandwidth

By turning switch 'S7' the level receiver selectivity can be set to the bandwidths 20 Hz and 3.1 kHz so as to adapt the receiver to the relevant measurement problems. It is also possible to replace the built-in D5020 20-Hz filter by a D5021 80-Hz filter. Furthermore, 2 additional filter modules are available, refer to Electrical specifications, section 1.2. To replace the filter remove the left cover of the level receiver.

2.4.3 Calibrating

Set the 2.3-MHz frequency on the frequency generator in

the locked mode and rotate switch 'S6' on the level receiver to the CCW stop. Of the display panels arranged in a semicircle around switch S6 the one on the extreme right lights up and the red calibrating triangle of the plexiglass is illuminated. The meter shows a deflection.

The meter pointer can now be set to the calibrating mark of the upper scale with the potentiometer '▼' (on the right of the meter).
The level receiver is now calibrated.

2.4.4 Measuring

The level meter sensitivity is selected with the switches 'S6' and 'S3' and read from the illuminated panel arranged around switch 'S6'.
Before connecting the specimen to input jack 'Bu3' by way of a coaxial cable (Z=75 Ω) the switches 'S3' and 'S6' should be set to the most insensitive position (one position before the left stop) if the level of the signal under test is unknown.
Increase the sensitivity by rotating switch 'S6' clockwise until an almost full-scale deflection is reached.
With full-scale deflection of the meter a sensitivity of -60 dBm (-70 dB) can thus be obtained.
If greater sensitivity is desired, rotate switch 'S3' step-by-step to the right.
The greatest sensitivity of -100 dBm (-110 dB) (full-scale deflection of the meter is achieved in the position 'low-distortion' of switch 'S3'.
The indication of the illuminated panel, which must be corrected as a result of the altered position of switch 'S3', is automatically adjusted.
The measured value is the sum of the level readings on the illuminated panel of switch 'S6' and on the meter.

2.4.4.1 Notes on the sensitivity settings of switches S6 and S3:
Rotation of the switch S6, sets the value of the attenua-

tor in the input of the level meter, while the rotation of the switch S3 sets the attenuation of a divider at the IF level of 100 kHz. The two switch positions can be so varied that, despite constant sensitivity, the first modulator once receives a strong and once a weak input signal. The strong signal results in a good S/N ratio ('low-noise'), the weak signal minimizes non-linear distortion ('low-distortion'). Normal level measurements are made in the 'low-noise' mode (switch S3 to the left). In the case of distortion measurements and spectral analysis (particularly when high level differences of the individual lines occur) and for measuring very low levels switch S3 is set to 'low-distortion', the influence of noise being reduced by selection of the narrow-band IF filter (S7).

Notes on setup 2:
In unsynchronized operation the frequency generator coupled with the level receiver must be tuned to the frequency of the level under test, i.e. to maximum indication on the meter of the level receiver.

Retuning the receiver can be avoided, even with a narrow-band filter, when the frequency is set in the locked mode at the transmit and receive ends and the 1-MHz standard frequency is taken from the same oscillator. See section 2.2.4.

2.4.4.2 Notes on very low level measurements

With setup 1 (automatic tuning between oscillator and receiver) couplings affecting the measurement accuracy may occur when very low levels (<-100 dB) are measured and when frequencies below 300 kHz are involved.

It is recommended in such cases that the measuring cable be connected to the W2021 level generator via the B2079 suppressor network to eliminate the couplings.

In measurements at higher frequencies (f > 300 kHz) the suppressor network is not used and should be removed to avoid the frequency response being affected.

2.4.5 Scale-spread device

The D2021 level receiver offers the possibility of an expanded presentation of the absolute level. Make sure that switch S3 is set to 'low-noise'.

2.4.5.1 Calibrating the level receiver using the scale spread device

After calibrating the level receiver with reference to 2.4.3, rotate switch 'S2' to the calibrating position '▼'. This also activates the scale spread device. Readjust the meter indication to '0' (▼mark) of the lower scale with the calibrating control.

2.4.5.2 Measuring with the scale spread device

The level under test must lie between -10 and 0 dB when the unexpanded indication is used (make the setting with switch S6, S3 being one position before the left stop 'low-noise'). Subsequently, set switch 'S2' to the meter reading.

The measured value is the sum of the readings on the switches 'S6' and 'S2' and the lower meter scale.

2.4.6 Connecting attachments

The application areas of the level receiver can be extended by connecting attachments.

2.4.6.1 IF output I, Bu4 (red dot): IF = 100 kHz

The wide dynamic range of the level meter (approx. 100 dB) can be utilized at this output. The output level (across

600 Ω) equals the input level (maximum permissible input level 0 dB, 0 dBm). The built-in meter is disconnected.

Setting: Set the sensitivity switch S6 so that the red dots coincide.
IF bandwidth as required (S7)
Output jack termination: 600 Ω

Use:
1. Selective sweep measurements using the D2001 level tracer with the D920 logarithmic amplifier.
   Level-linear presentation of traces with attenuation differences up to 100 dB, without level range switching.
2. By connecting the D2010 digital level meter to the D2014 plug-in, the level values can be displayed digitally and printed out. (The B2028 voltage divider is additionally required for absolute measurements.)

2.4.6.2 IF output II, Bu5, IF = 100 kHz

When this output is used, the readout is maintained. The output level is 0 dB across 75 Ω when the meter pointer is on the zero mark.

Setting: Set sensitivity switch S6 according to the input level, but S3 to 'low-noise',if possible.
IF bandwidth as required (S7)
The level reading on switch S6 must now be corrected by the fixed value +10 dB (illuminated panel on the right of the meter); however, this is necessary only when measuring absolute levels.

Use:
1. Selective sweep measurements using the D2001 level tracer with a linear amplifier.
   Voltage-linear presentation of traces.
   Accurate measurement by spreading the Y-axis up to about 15 mm per 0.1 dB indicated.
2. By connecting the D2010 digital level meter

with the D2014 plug-in, the level values can be displayed digitally and printed out.

2.4.6.3 Recorder terminal

A high-impedance voltage recorder can be connected to 'Bu7' for continuous supervision, for instance.

2.4.6.4 Probes

Probes are available for high-impedance level measurements. The power is supplied by Bu1. Connect the probe output to Bu3. Apply the probe calibrating voltage to Bu2 when S3 is at the left-hand stop.

2.4.6.5 Earphone

For monitoring signals or noise an earphone can be connected to jack Bu6, which supplies the input signal translated to the audible range.

2.4.6.6 Additional accessories

Additional accessories increase the number of applications of the test setup; they are listed under 1.5.

B2024 preamplifier. This is connected before the D2021 level receiver for measuring very low levels (crosstalk measurements). The power is supplied by jack Bu1.

B2077 balancing transformer. This is used for measuring balanced specimens. It is connected to input jack Bu3.

For continuous supervision it is possible to connect an interfering pulse or interruption counter to the earphone output in addition to the recorder connected to the dc output (Bu7) (see 2.4.6.3).

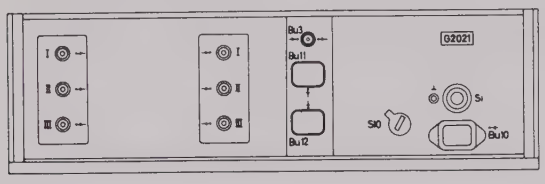
D2020/D2014 digital level meter. This is connected to the IF output; it indicates the measured values in digital form. The measured values can also be printed out.

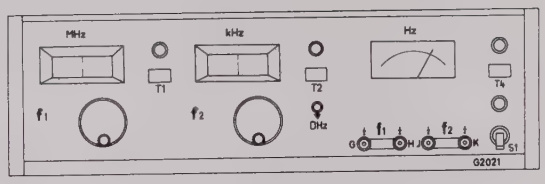
P2004 phase meter. This can also be combined with the test setup. This combination permits phase measurements over the entire range from 10 kHz to 25 MHz.

2.5 BRIEF OPERATING INSTRUCTIONS

G 2021
W 2021
D 2021

2.5.1 Frequency generator





2.5.1.1 Set the device to the line voltage value with S10 and insert a suitably rated fuse, switch on the device with S1.

2.5.1.2. Standard frequency

Internal standard frequency: T4 released
External standard frequency: T4 pushed,
apply external standard frequency to Bu3.
(E = 0.5 to 5 V_{p-p}; f = 1 MHz; Z ∿ 75 Ω).

2.5.1.3 Mode of operation

f_1 and f_2 locked, 1-MHz internal standard frequency:
T1 and T2 pushed
T4 released
Read from scales f_1 and f_2 (pilot lamps light up)

f_1 locked, f_2 continuous, 1-MHz internal standard frequency:
T1 pushed
T2, T4 released
Read from scales f_1 (lamp lights up) and f_2 and the meter

f_1 continuous, f_2 locked, 1-MHz internal standard frequency:
T1, T4 released
T2 pushed
Read from scales f_1 and f_2 (lamp lights up)

2.5.1.4 Calibration of f_2

T1 pushed (f_1 locked)
T2 released
T4 released (pushed for 1-MHz external standard frequency)

Set the f_2 scale to 0 kHz, establish zero meter deflection (▼) with calibrating potentiometer ▼.

To check the calibration: set the locked f_1 and the unlocked f_2 to '0'; the pointer of the level generator meter must be at the left stop, that of the level receiver meter (bandwidth 20 Hz or 80 Hz) at the right stop.

2.5.1.5 Synchronization

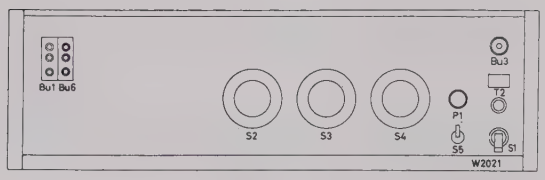
Of setup 1 (with 1 frequency generator): see Fig. 2.

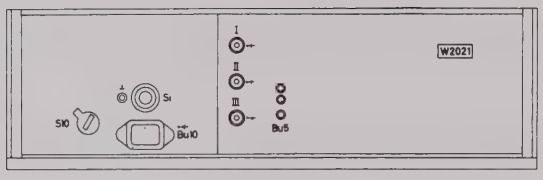
The transmit and receive sections are synchronized by the cables at the rear.

Of setup 2 (with 2 frequency generators): see Figs. 3 and 4

Change the cabling as for setup 1, Fig. 2

2.5.2 Level generator





2.5.2.1 Set the device to the correct line voltage value with S10 and insert a suitably rated fuse, turn on the device with S1. Connect the level generator to the frequency generator (Fig. 2 or 4)

2.5.2.2 Transmitting with Z = 75 Ω

T2 released
Set the desired level with the switches S2, S3, S4.
Output level +10 dBm to -69.9 dBm, 0 dB to -79.9 dB.
After switching on with S5, continuous fine control with P1 by approx. +0.15 dB.

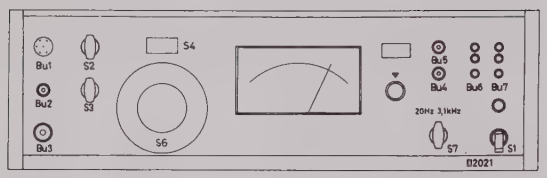
2.5.2.3 External modulation

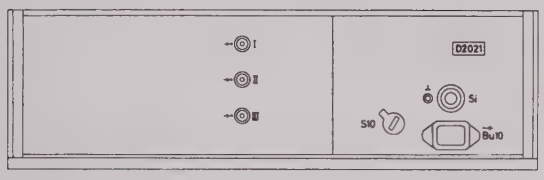
T2 released
Apply the modulation voltage to Bu1.
Set the output level at Bu3 with S2, S3 and S4.
Output level remains regulated.

2.5.2.4 Level suppressor

Button 2 pushed

2.5.3 Level receiver





2.5.3.1 Set the device to the correct line voltage value and insert a suitably rated fuse, switch on the device with S1. Connect the level receiver to the frequency generator (Fig. 2 or 4).

2.5.3.2 Selecting the bandwidth:

Set S7 to the relevant position

2.5.3.3 Calibrating

Set the 2.3-MHz frequency
Rotate S6 to the left-hand stop.
Adjust the meter deflection to the calibrating mark▼ (upper meter scale) with the calibrating potentiometer.

2.5.3.4 Measuring

Connect the measuring cable to Bu3.

Level measurement:

Set S3 to 'low-noise', if possible (one position before the left stop).
Set the sensitivity with S6; if it is not sufficient, increase it step by step starting with S3.

Harmonic distortion measurement, frequency analysis:

Set S3 to 'low-distortion (right-hand stop)
Set the sensitivity with S6.
Always read the level from the illuminated panel around S6 and from the meter.

2.5.3.5 Scale-spread device

2.5.3.5.1 Calibrate as specified under 2.5.3.3, then set S2 to calibrating mark▼ and activate the scale-spread device.
Adjust the meter deflection to the calibrating mark▼ (lower meter scale) with the calibrating potentiometer.

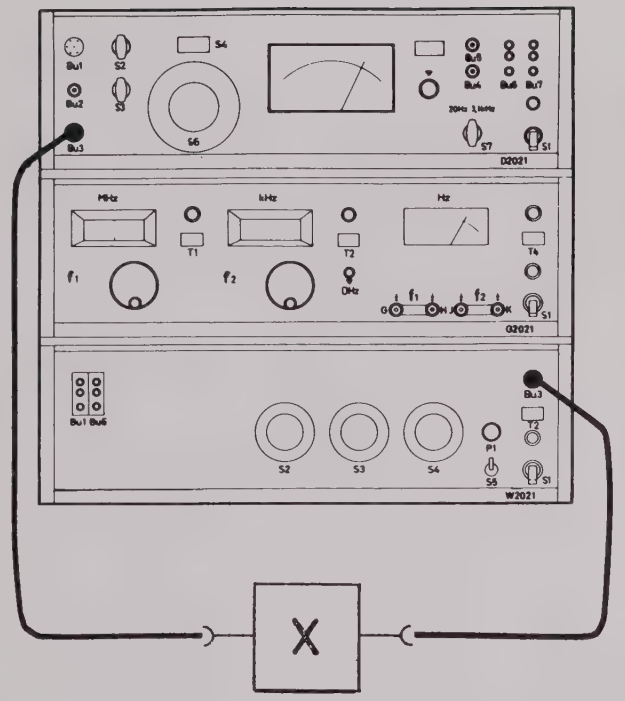
2.5.3.5.2 Measuring with the scale-spread device

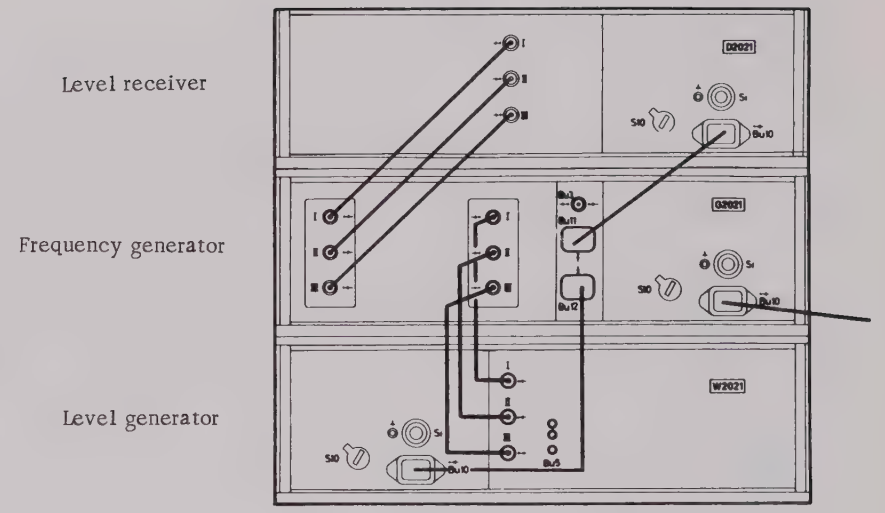
Set S3 to 'low-noise', i.e. one position before the left stop. The meter reading (with scale spread disabled) must lie between -10 and 0 dB. Adjust the deviation from zero with S2.
The measured value is the sum of the readings on the switches S6 and S2 and the meter (lower scale).

2.6 Annexed figures of the test setup

The following figures illustrate the test setup configurations and the cabling as well as the setting of the controls for different measurement problems. Ensure that the cables used are in perfect condition.
The following uses are shown in detail:

	No. of Fig.
1. Point-by-point measurement	
Attenuation measurement (with automatic tuning system)	1
Return loss measurement (with automatic tuning system	2
Phase measurement	3
Attenuation measurement on a frequency converter	4
Harmonic distortion measurement	5
2. Sweep measurement	
Connection of the G2022 sweep attachment (transmit end)	6
Connection of the G2022 sweep attachment (receive end)	7
2.1 Broadband sweep measurement	
Attenuation measurement, wide sweep range	8
Attenuation measurement, narrow sweep range	9
Attenuation comparison measurement	10
2.2 Selective sweep measurement	
Attenuation measurement	11
Return loss measurement	12
Frequency analysis	13





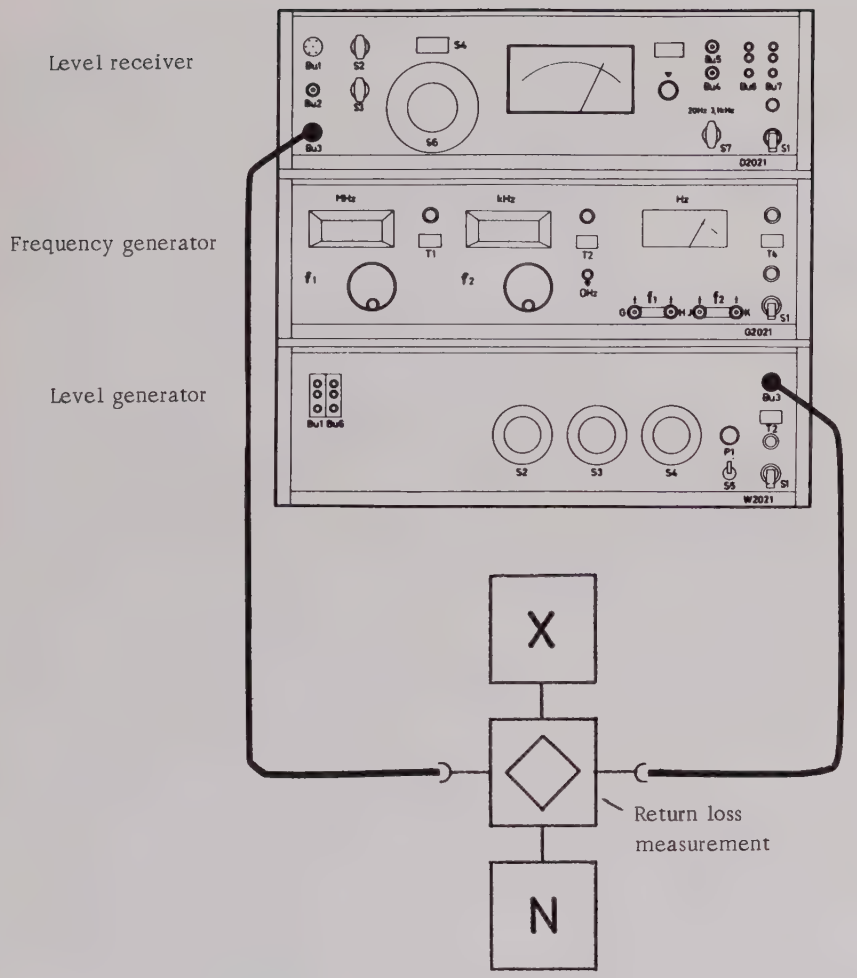
Rear

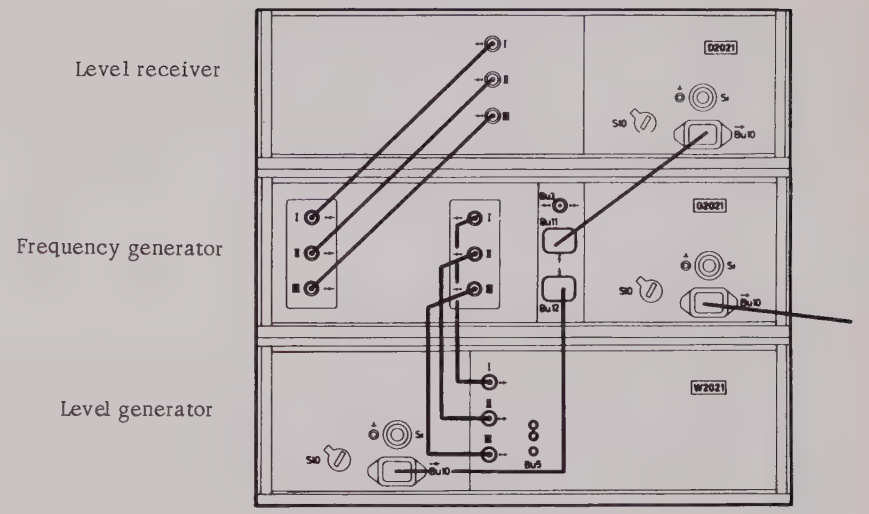
Frequency generator	T1, T2	→	Locking mechanism on/off
	f1, f2	→	Frequency
	T4	→	no pushed
Level generator	S2, S3, S4	→	Level
	(S5, P1	→	Fine level control
Level receiver	S7	→	Bandwidth
	S3	→	Low-noise
	S6	→	Sensitivity
	(S2	→	Scale-spread device

Fig. 1

LEVEL TEST SETUP 10 kHz to 25 MHz

Point-by-point measurement with
automatic tuning system
Attenuation measurement



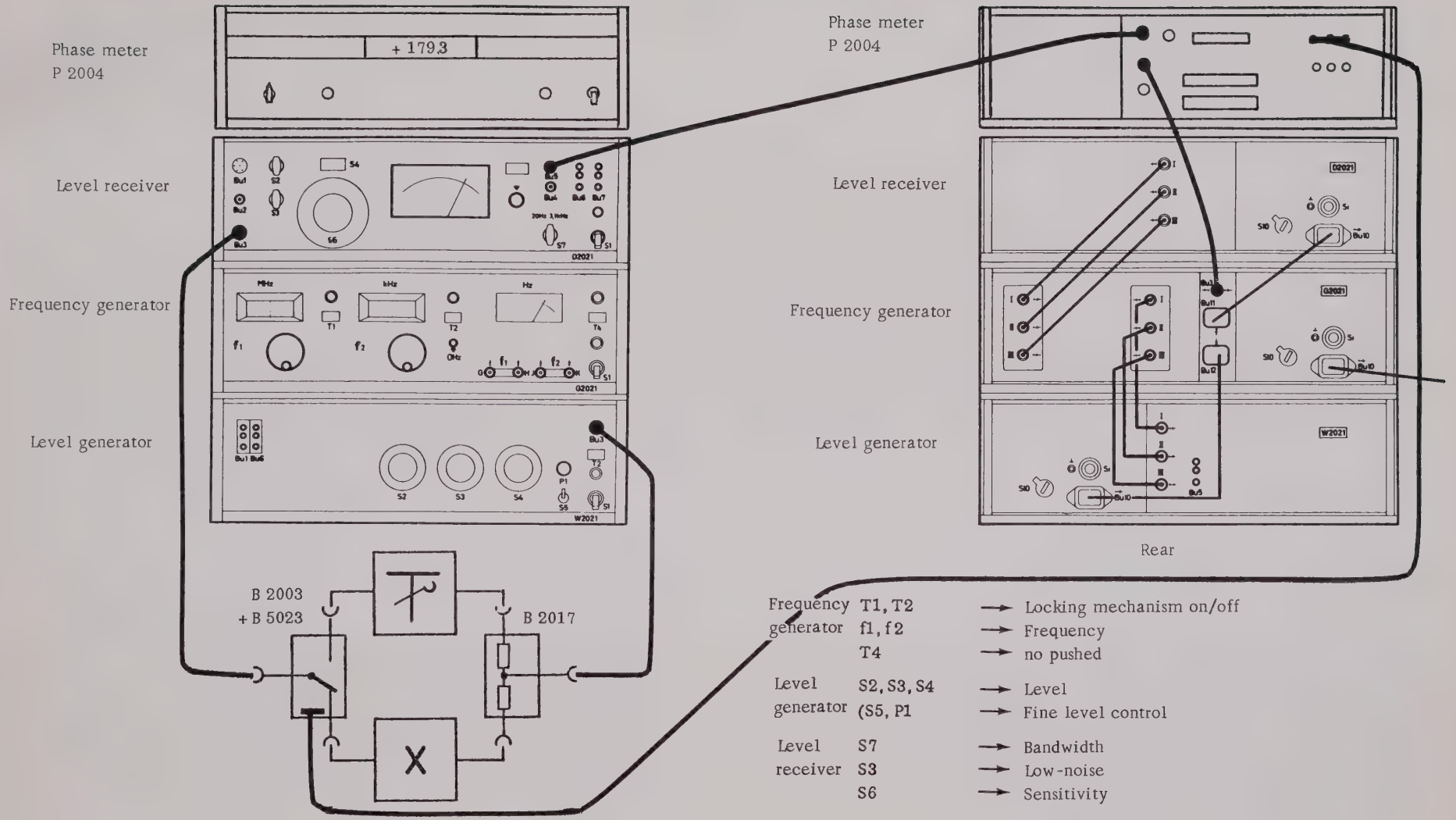


Frequency generator	T1, T2	→	Locking mechanism on/off
	f1, f2	→	Frequency
	T4	→	no pushed
Level generator	S2, S3, S4	→	Level
	(S5, P1	→	Fine level control
Level receiver	S7	→	Bandwidth
	S3	→	Low-noise
	S6	→	Sensitivity

LEVEL TEST SETUP 10 kHz to 25 MHz

Point-by-point measurement with automatic tuning system
Return loss measurement

Fig. 2



LEVEL TEST SETUP 10 kHz to 25 MHz

Point-by-point measurement with
automatic tuning system
Phase measurement

Fig. 3

Level oscillator

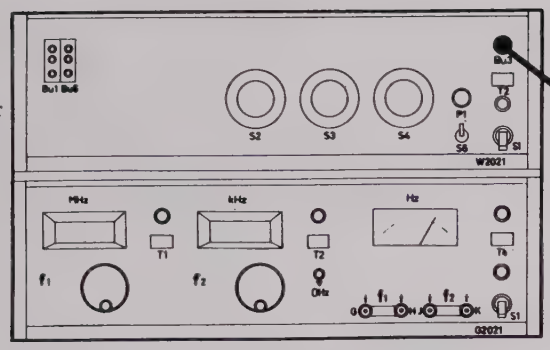
Level meter

Level generator

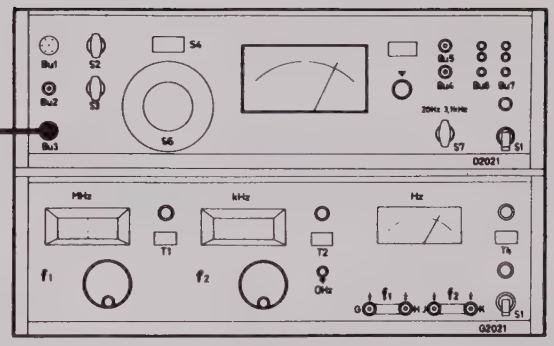
Frequency generator

Level receiver

Frequency generator



X

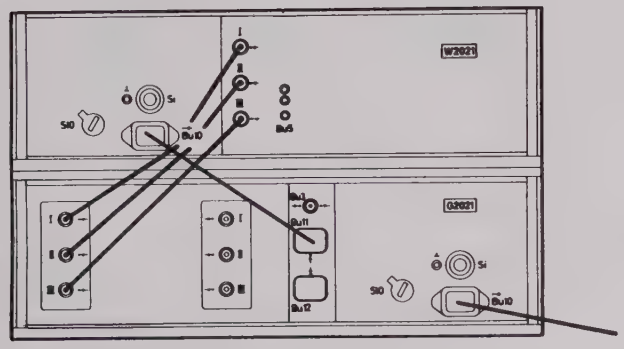


Frequency generator	T1, T2	→	Locking mechanism on/off
	f1, f2	→	Frequency
	T4		no pushed
Level receiver	S2, S3, S4	→	Level

Frequency generator	T1, T2	→	Locking mechanism on/off
	f1, f2	→	Tune to receive frequency
	T4		no pushed
Level receiver	S7	→	Bandwidth
	S3	→	Low-noise
	S6	→	Sensitivity
	(S2	→	Scale spread device

Level generator

Frequency generator



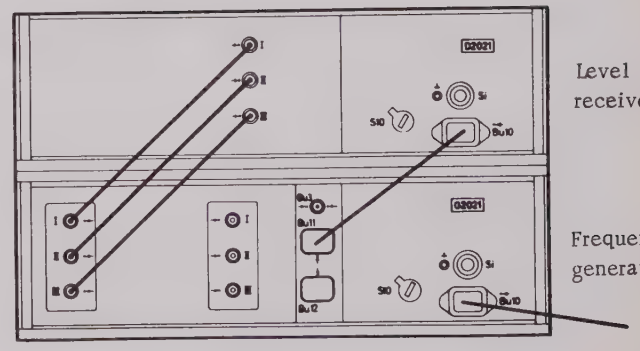
Level oscillator

Rear

LEVEL TEST SETUP 10 kHz to 25 MHz

Point-by-point measurement
Transmit and receive sections are tuned separately

Attenuation measurement on a frequency converter, for instance



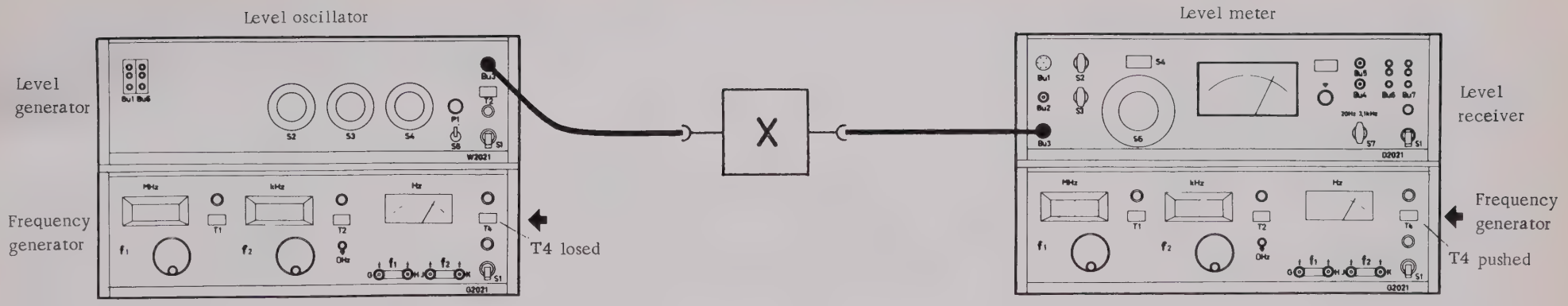
Level meter

Rear

Level receiver

Frequency generator

Fig. 4

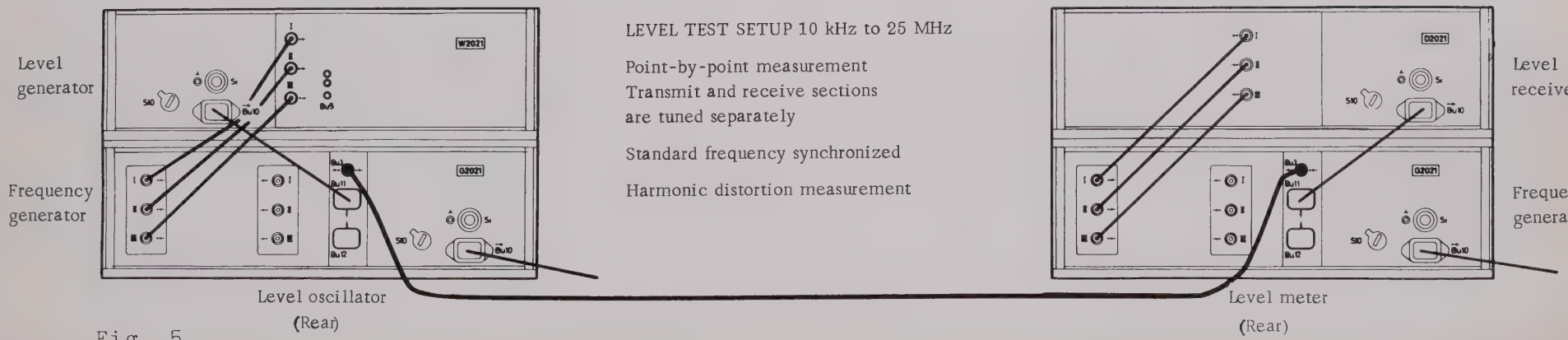


Frequency generator T1, T2 → Locking mechanism on (pushed)
f1, f2 → Frequency

Level generator S2, S3, S4 → Level

Frequency generator T1, T2 → (pushed) locking mechanism on
f1, f2 → Set to harmonics

Level receiver S7 → Bandwidth
S3 → Low-noise
S6 → Sensitivity



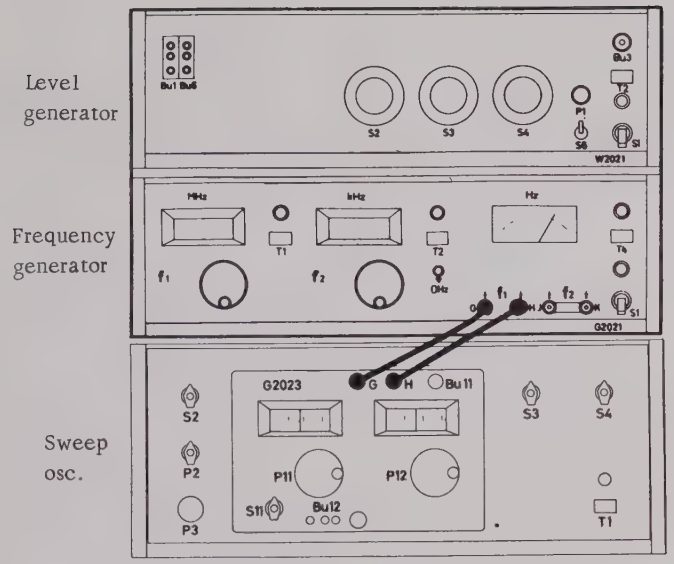
LEVEL TEST SETUP 10 kHz to 25 MHz

Point-by-point measurement
Transmit and receive sections
are tuned separately

Standard frequency synchronized

Harmonic distortion measurement

Fig. 5

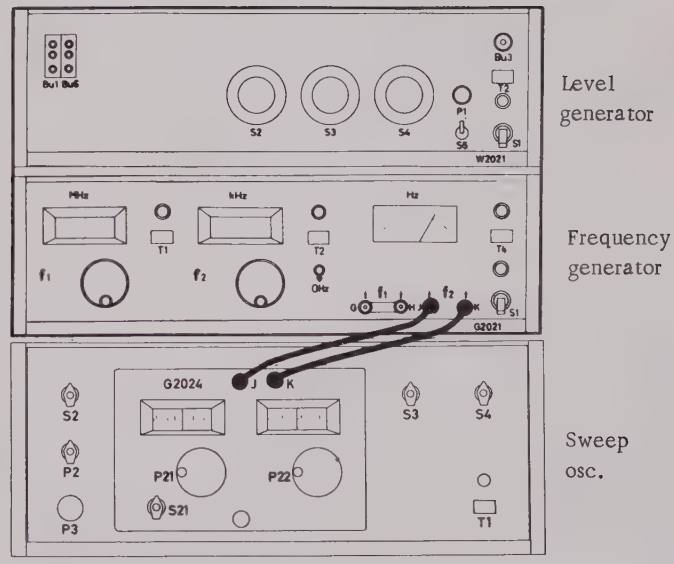


Sweeping f1 with
G 2023 plug-in
Wide sweep range

Level generator
W 2021

Frequency generator
G 2021

Sweep attachment
G 2022



Sweeping f2 with
G 2024 plug-in
Narrow sweep range

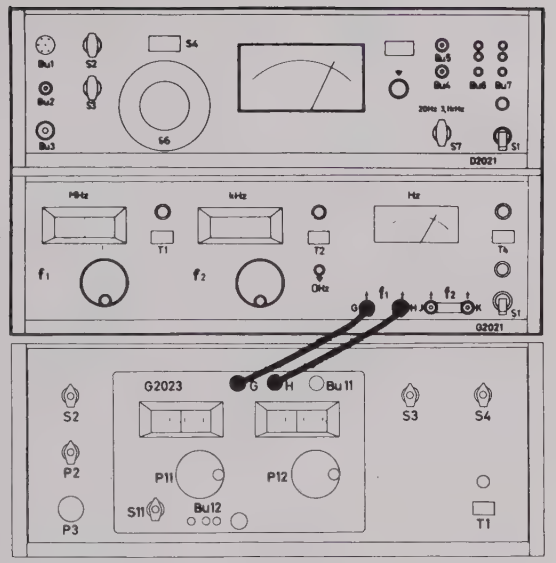
Sweep osc.	S11	→	Start-Stop	fm $\pm\Delta$f	CW
	P11	→	Lower cutoff frequ.	Mid-frequency	Fixed frequency
	P12	→	Upper cutoff frequ.	Range	–
	S2, P2	→	Sweep rate	–	–
Frequency generator	f1	→	Marker frequency		–
Level generator	S2, S3, S4	→	Level		Level

Sweep osc.	S21	→	fm $\pm$ 0,1 Δ f	fm $\pm\Delta$f	CW
	P21	→	Mid-frequency		Fixed frequency
	P22	→	Range		–
	S2, P2	→	Sweep rate		–
Frequency generator	f2	→	Marker frequency		–
Level generator	S2, S3, S4	→	Level		Level

LEVEL TEST SETUP 10 kHz to 25 MHz

Connecting the G2022 sweep attachment
to the G2021 frequency generator
Transmit end

Fig. 6



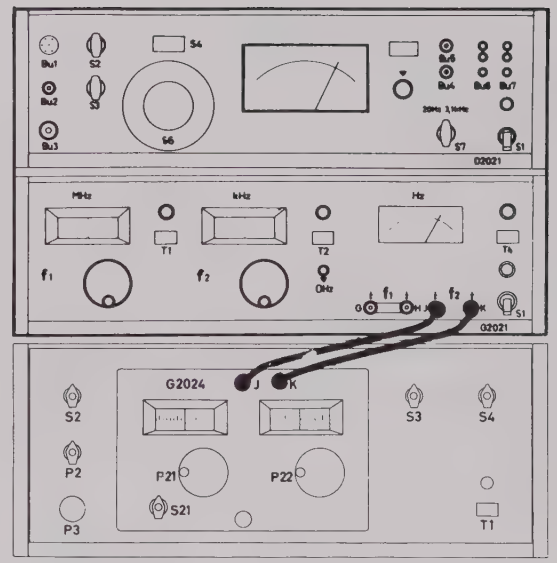
Sweeping f1 with
G 2023 plug-in
Wide sweep range

Sweep osc.	S11	→ Start-Stop	fm ±Δf	CW
	P11	→ Lower cutoff frequ.	Mid-frequency	Fixed frequency
	P12	→ Upper cutoff frequ.	Range	–
Frequency generator	S2, P2	→ Sweep rate		–
	f1	→ Marker frequency		–
Level receiver	S7	→ Bandwidth		
	S3	→ Low-noise		
	S6	→ Sensitivity		

Level receiver
D 2021

Frequency generator
G 2021

Sweep attachment
G 2022



Sweeping f2 with
G 2024 plug-in
Narrow sweep range

Sweep osc.	S21	→ fm ± 0,1Δf	fm ±Δf	CW
	P21	→ Mid-frequency		Fixed frequency
	P22	→ Range		–
Frequency generator	S2, P2	→ Sweep rate		–
	f2	→ Marker frequency		–
Level receiver	S7	→ Bandwidth		
	S3	→ Low-noise		
	S6	→ Sensitivity		

Fig. 7

LEVEL TEST SETUP 10 kHz to 25 MHz

Connecting the G2022 sweep attachment
to the G2021 frequency generator
Receive end

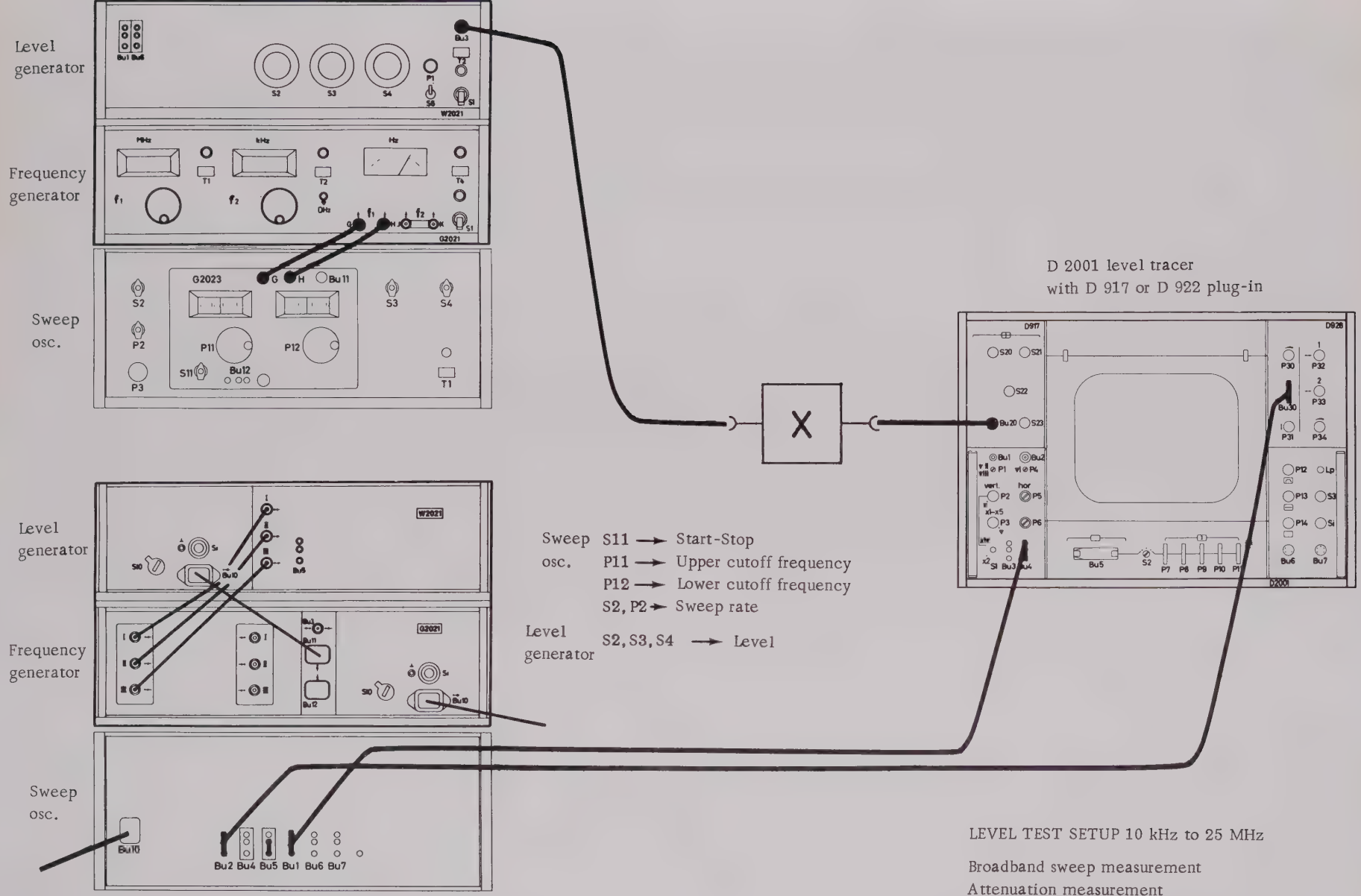

Level generator
Frequency generator
Sweep osc.
D 2001 level tracer
with D 917 or D 922 plug-in
X
Level generator
Frequency generator
Sweep osc.
Sweep osc. S11 → Start-Stop
P11 → Upper cutoff frequency
P12 → Lower cutoff frequency
S2, P2 → Sweep rate
Level generator S2, S3, S4 → Level
LEVEL TEST SETUP 10 kHz to 25 MHz
Broadband sweep measurement
Attenuation measurement
Wide sweep range

Fig. 8

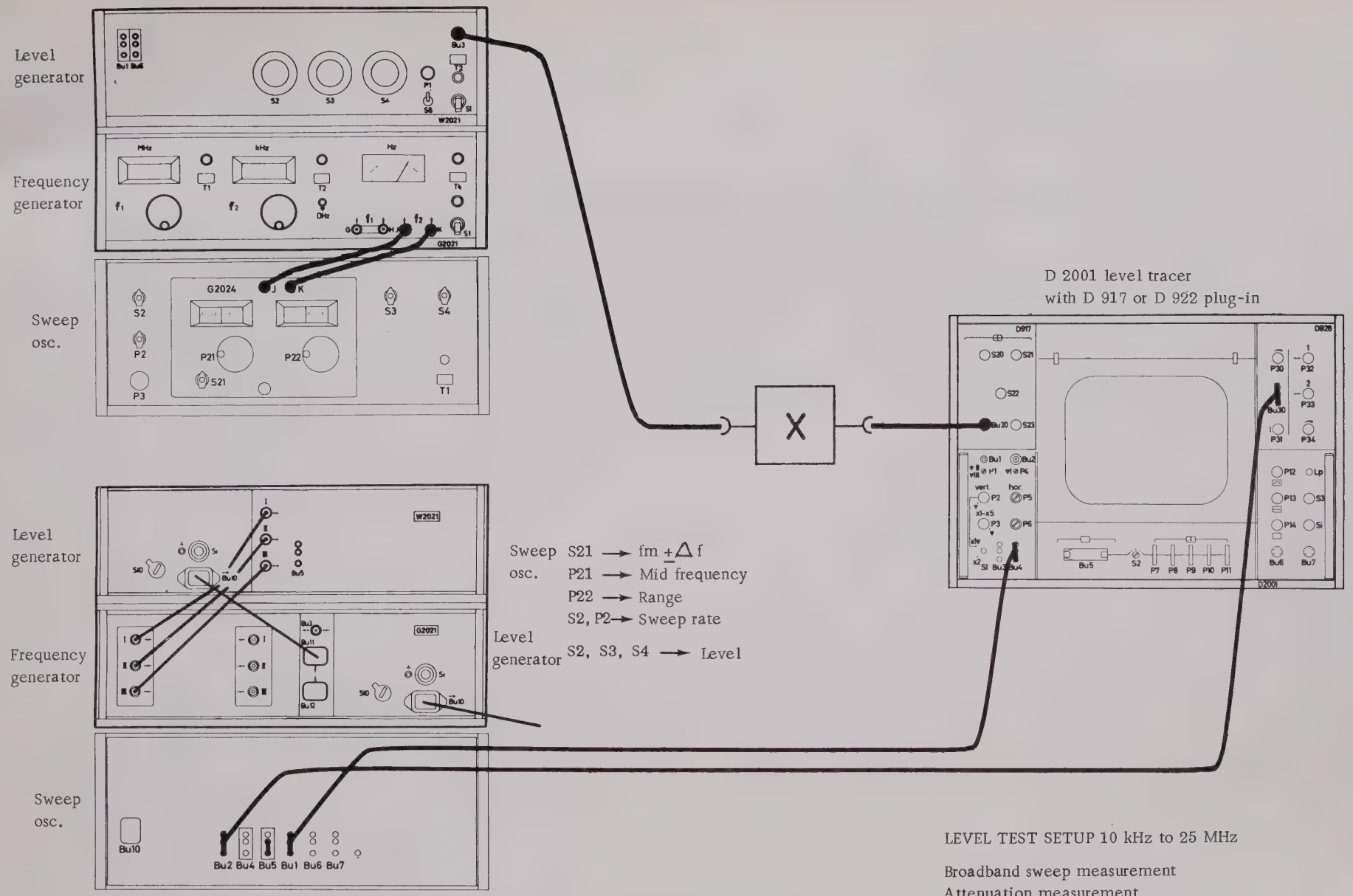
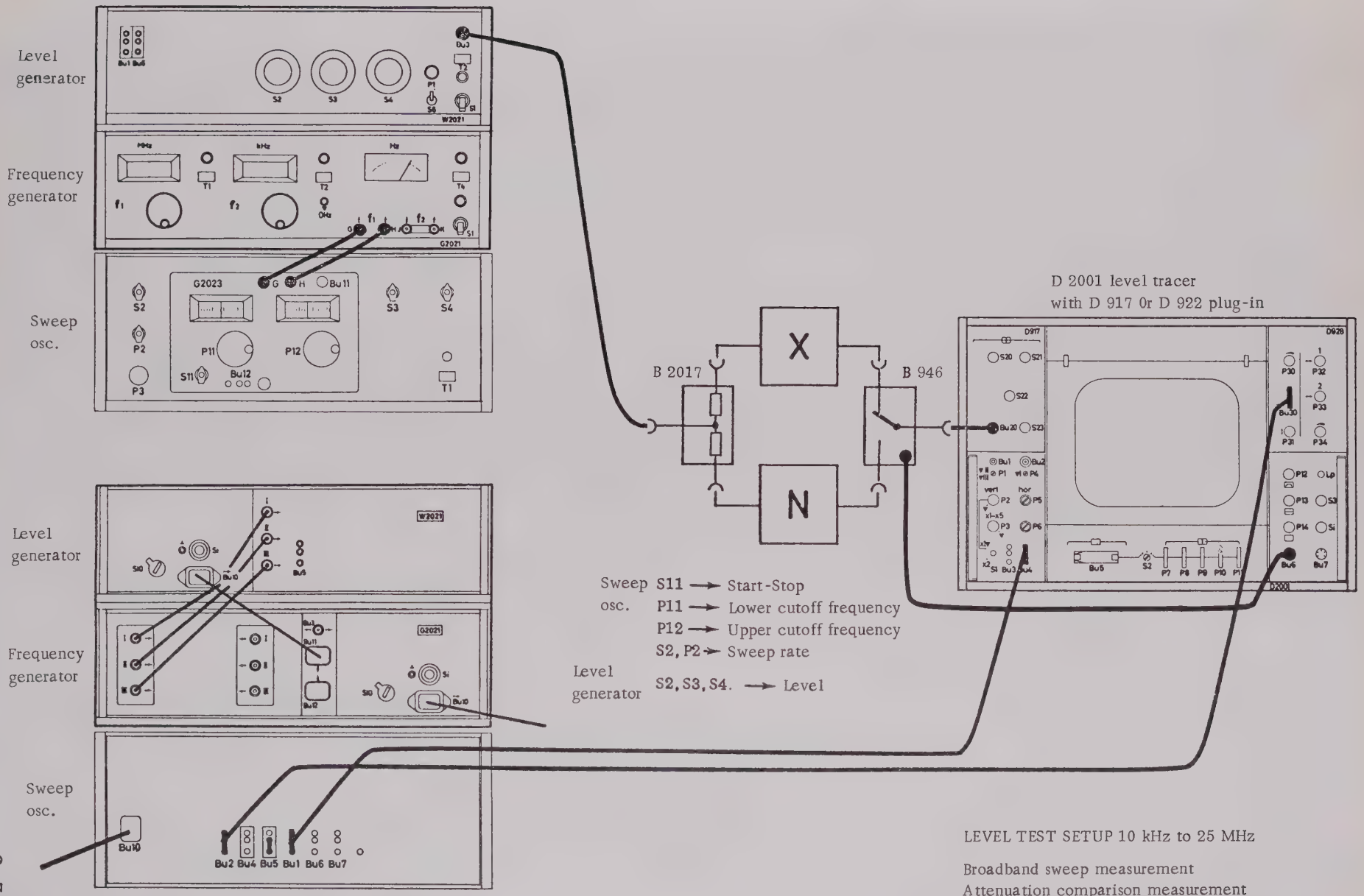


Fig. 9

LEVEL TEST SETUP 10 kHz to 25 MHz

Broadband sweep measurement
Attenuation measurement
Narrow sweep range



LEVEL TEST SETUP 10 kHz to 25 MHz

Broadband sweep measurement
Attenuation comparison measurement
Wide sweep range

Fig. 10

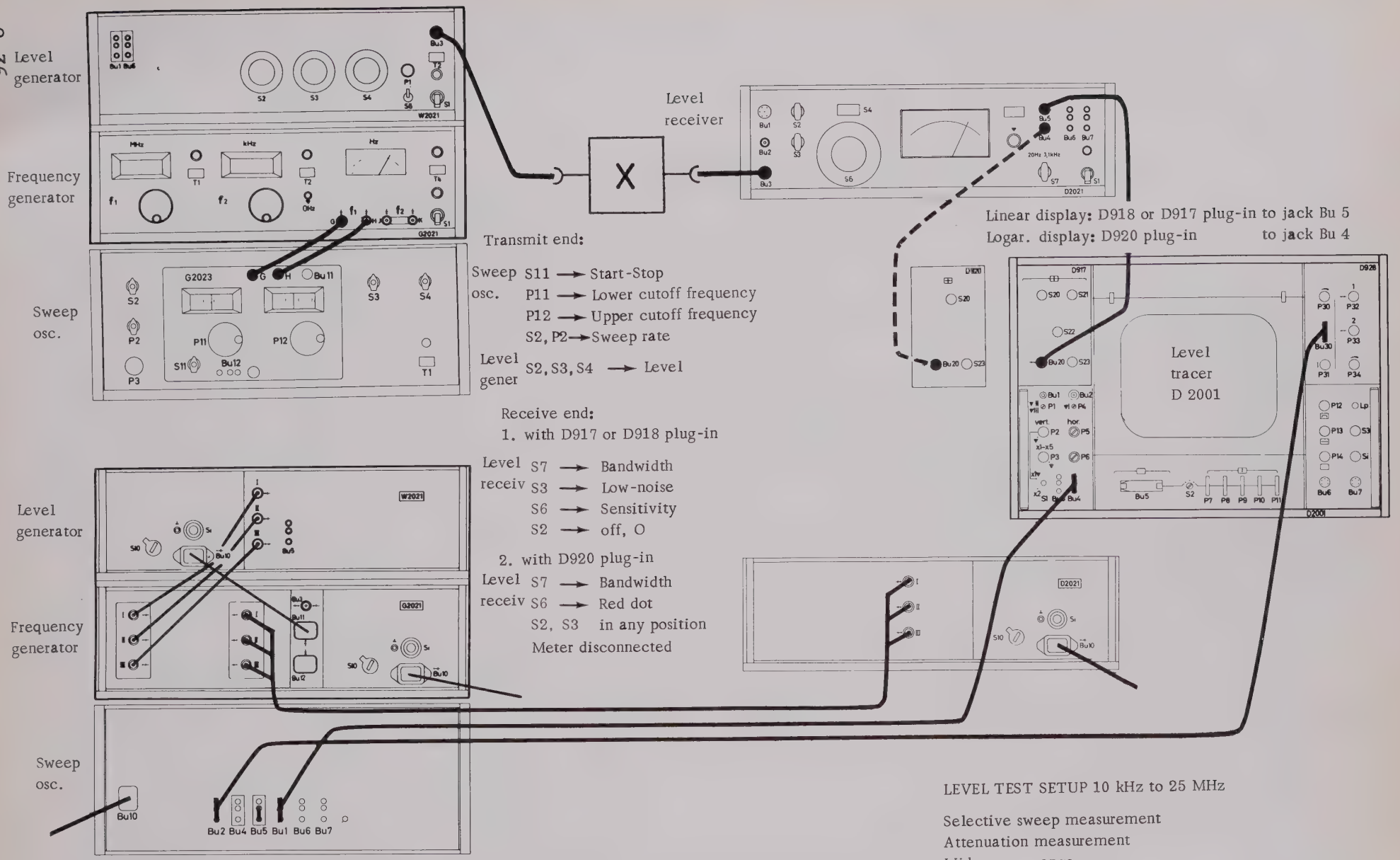


Fig. 11

LEVEL TEST SETUP 10 kHz to 25 MHz

Selective sweep measurement
Attenuation measurement
Wide sweep range

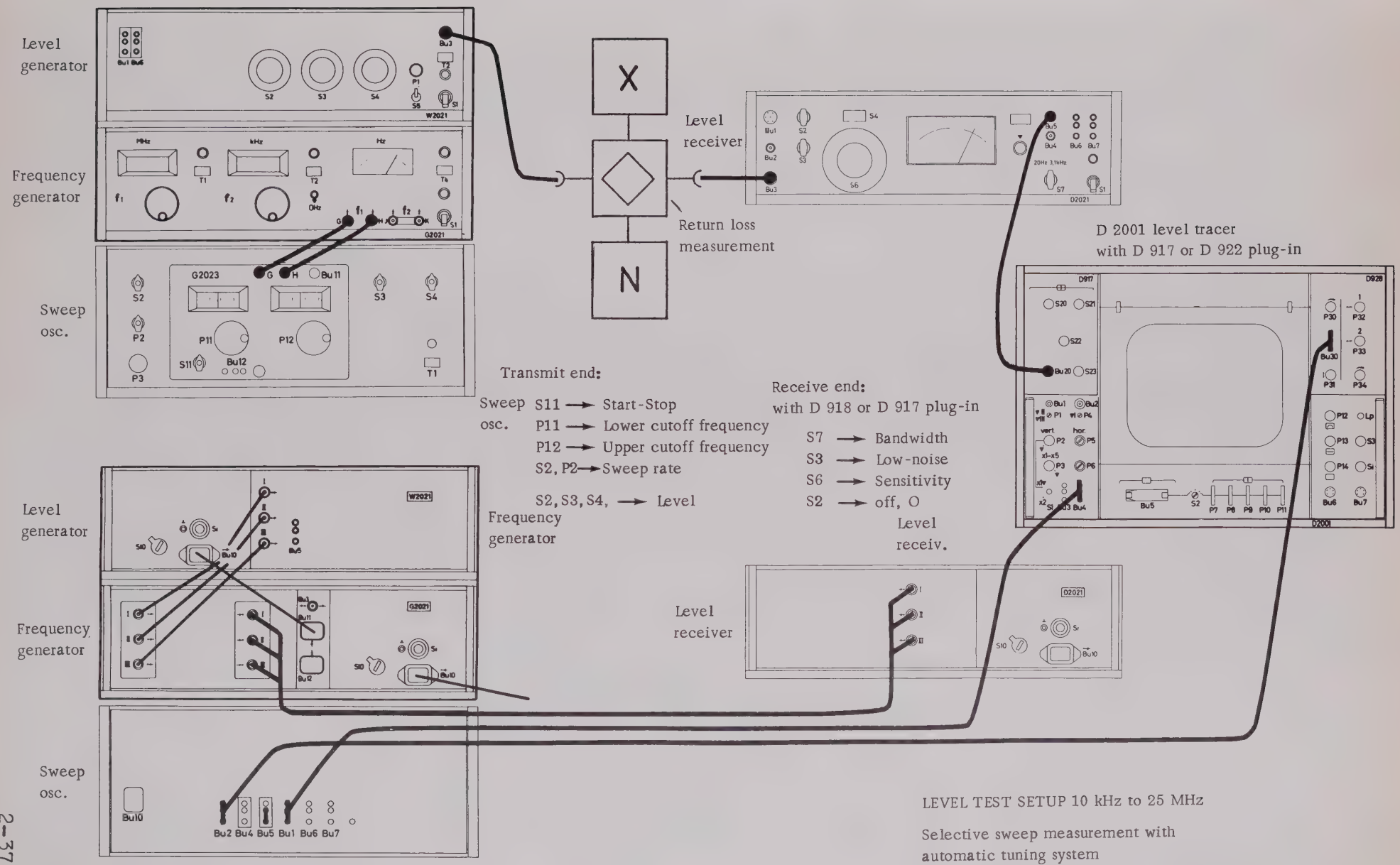


Fig. 12

LEVEL TEST SETUP 10 kHz to 25 MHz

Selective sweep measurement with
automatic tuning system
Return loss measurement
Wide sweep range

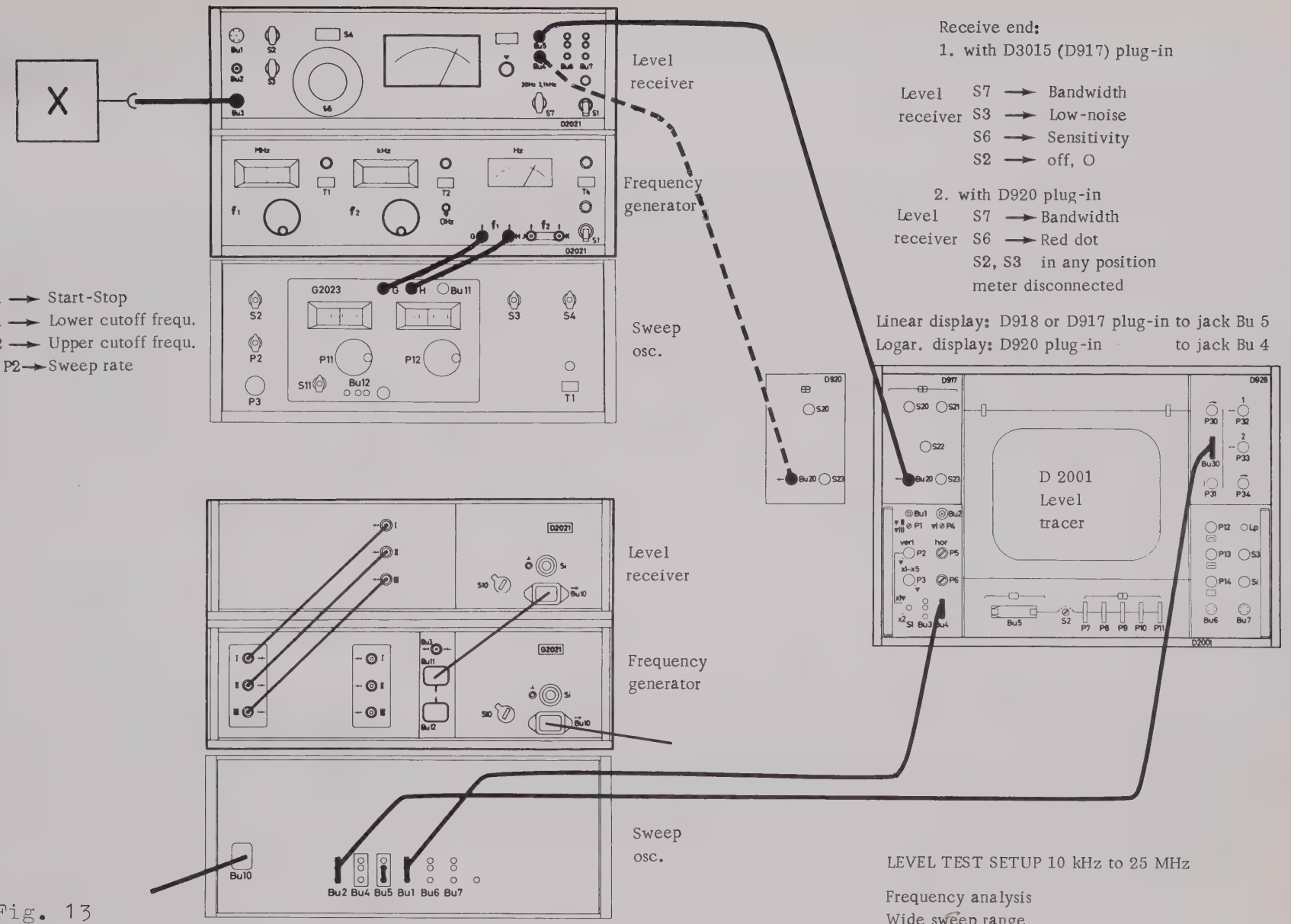

X
Level receiver
Frequency generator
Sweep osc.
Sweep osc. S11 → Start-Stop
P11 → Lower cutoff frequ.
P12 → Upper cutoff frequ.
S2, P2 → Sweep rate
Receive end:
1. with D3015 (D917) plug-in
Level receiver S7 → Bandwidth
S3 → Low-noise
S6 → Sensitivity
S2 → off, O
2. with D920 plug-in
Level receiver S7 → Bandwidth
S6 → Red dot
S2, S3 in any position
meter disconnected
Linear display: D918 or D917 plug-in to jack Bu 5
Logar. display: D920 plug-in to jack Bu 4
D 2001
Level
tracer
Level receiver
Frequency generator
Sweep osc.
LEVEL TEST SETUP 10 kHz to 25 MHz
Frequency analysis
Wide sweep range

Fig. 13

3. M A I N T E N A N C E

The device is so constructed that no regular maintenance and current supervision is required.
However, due to the aging of the component parts, the optimum settings may change over a long period of time. By observing the following notes, the necessary work can be carried out.

The aligning elements are so arranged that they are accessible after the removal of a corresponding cover panel. The resetting work can only be carried out after thermal equilibrium of the equipment has been reached after approx. 2 hours.

1.1 CORRECTING THE "1-MHz STANDARD FREQUENCY"

Connect a frequency counter (absolute error $\frac{\Delta f}{f} \leq \pm 5 \times 10^{-8}$) which has settled down to its ultimate temperature, to jack "Bu3" at the rear of the equipment.

Button "T4" is released.
Remove the right-hand cover panel. The aligning hole of C9 in the f_o-oscillator S45035-G5001 is thus accessible.
By means of the glass-type tubular trimmer C9, set the "standard frequency" to f = 1 000 000.0 Hz $\pm$0.3 Hz.
Pull the aligning pin out of the hole and wait for two passes of the frequency counter. The frequency must amount to 1 MHz $\pm$0.5 Hz. Realign if required.

1.2 CORRECTING THE FREQUENCY SCALES

1.2.1 Resetting the Frequency Scale f_1 (MHz-scale):

Synchronize a frequency counter with the "standard frequency" of the frequency generator G2021, i.e. connect jack 3 at the rear of the frequency generator to jack "Synchr. ext." of the frequency counter. Set the switch of the frequency counter to position "Synchr. ext.". Buttons T4 and T1 of the frequen-

cy generator are released.

Remove the "sweep oscillator G-H" link.

Connect the frequency counter to Bu G.

Set the frequency scale f_1 to 0 MHz (25 MHz).

The frequency counter must read f = 45 MHz $\pm$ 15 kHz (70 MHz $\pm$ 20 kHz).

A parallel shift of the scale, i.e. approx. equally high frequency deviations of both values can be corrected by resetting the scale window (index mark). For this purpose, remove the driving knobs and the front panel with the hexagon socket spanner in the spare parts box (see item 1.3. of this Notes on Maintenance part). After slackening the two small fillister-head screws (about one turn), the index line can be shifted correspondingly. If the frequency deviates at the upper or lower scale end only, it can be reset with C15 of G5008, after removing the upper cover panel; i.e. set the scale to the end to be corrected and set the corresponding frequency with C15. Check the other scale end subsequently. A possibly resulting parallel shift of the scale can be corrected as described above. Reinsert the"sweep oscillator G-H link. For conformity of the scale "with/without lock-in", see section 2.5.4.4.4.

1.2.2 Resetting the Frequency Scale f_2 (kHz-scale):

Synchronize a frequency counter with the "standard frequency" of the frequency generator (see 1.2.1). The buttons T4 and T2 are released. Remove the "sweep oscillator J-K" link. Connect the frequency counter to BuJ

Set the f_2 scale to 0 kHz. Using potentiometer P1 "0 Hz" adjust the counter reading to f = 1 000 000 kHz. The instrument indication must be zero. The potentiometer should still have a regulating margin of $\geq \pm$ 200 Hz.

Now set the scale to 100 kHz; the frequency counter must read f = 900 000 kHz $\pm$ 70 Hz. If the deviation is too high, remove the cover panel and effect a correction using C3 of G5014.

Repeat the 0-Hz calibration and recheck the scale at 100 kHz. A parallel shift of the scale can be corrected as described under 1.2.1. Reinsert the "sweep oscillator J-K" link. For conformity of the scale "with/Without lock-in" see section 2.5.7.4.7.

1.2.3 Resetting the Instrument Indication (Hz-scale)

As a first step with the equipment turned off, set the pointer to "0" using the screw visible below the instrument. Then synchronize a frequency counter, that has settled down to its ultimate temperature, with the "standard frequency" of frequency generator G2021 (see item 1.2.1 of this Notes on Maintenance part). Remove the "sweep oscillator J-K" link. Connect the frequency counter to jack J and set the reading to f = 950 400 kHz $\pm$ 1 Hz using the f_2 tuning control (f_2 film scale indicates approx. 49.6 kHz).
Remove the upper cover plate of the G2021 and set the instrument indication to 400 Hz using R50 of the f_2-oscillator S45035-G5014. Reinsert the "sweep oscillator J-K" link.

1.3 EXCHANGING THE INDICATING LAMPS

Spare lamps, fuses, lamp extractors, board pulling hooks and a hexagon socket spanner for the control knobs of the film drives are situated in a spare parts bag that becomes accessible after removing the upper cover plate. Only a single lamp type (same voltage, same current) is used in the equipment. All indicating lamps are fitted in bayonet holders and can be taken out of the holder by applying light pressure and a simultaneous quarter turn after removing the lamp cap with the aid of the lamp extractor.

4. FAULT LOCATION - FAULT ELIMINATION

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4. FAULT LOCATION, FAULT ELIMINATION

2.1 FAULT LOCATION WITH THE MEASURING SETUP TURNED OFF

First check the measuring setup layout according to Fig. 2 or 4 (see Instructions for Use). Check all power supply and coaxial connecting cords for firm seating of plugs and satisfactory operating condition.
Check for possible operating errors on any of the units related to the measuring setup.
If a unit has failed completely (all indicating lamps are dark), check power cable and mains fuse.
Remove shielding plates of the faulty unit and carry out a visual inspection. Check the plug-in subassemblies for firm seating. At first, the visual inspection should be limited to the equipment cabling only since most of the subassemblies are shielded against audio or RF pick-up. As far as possible, only the subassembly that has been clearly identified as being faulty should be opened.

2.2 FAULT LOCATION WITH THE MEASURING SETUP TURNED ON

The measuring setup is composed from individual equipment units. Level generator W2021 and frequency generator G2021 make up the level oscillator; level receiver D2021 together with frequency generator G2021 make up the level meter. Therefore, an electrical functional check of an individual unit D2021 and W2021, respectively, is only possible in conjunction with the frequency generator G2021. The dc voltage checks are independent thereof.
In the meantime, the frequency generator G2021, being an individual equipment unit, can be fully checked for its electrical functioning.

2.2.1 Required Measuring Instruments and Auxiliary Facilities

2.2.1.1 For Fault Location

DC multimeter
Zi $\geq$ 50 kΩ/V,
e.g. Siemens -/uA-Multizet meter
Multi-range RF-diode or electron-tube voltmeter
e.g. Siemens RF-Multizet meter
Cathode-ray oscilloscope,
e.g. Siemens wideband oscilloscope, Oszillar M214, with probe divider 10:1

100-MHz frequency counter, can be synchronized with 1 MHz (absolute error $\frac{\Delta f}{f} \leq \pm 5 \times 10^{-8}$).

75-Ω termination

Adapter S45034-B2035-A702 with adapter supplement S45034-B2036-A702

Adapter S45035-F263-A701

2.2.2 General Notes on Fault Location and Fault Elimination

When connecting an exposed chassis to the mains, observe the safety regulations, e.g. those of the VDE (Association of German Electrical Engineers).
This work must be carried out by skilled personnel only. If the type of fault encountered is specified in the fault location table, action taken in accordance with the respective note will considerably shorten the fault locating operation. Information on fault location includes the fault location plans No. 1 to 7 and the fault location table, furthermore the corresponding wiring diagrams and the circuit diagrams of the equipment unit and the subassemblies. The fault location table indicates the fault location plans to be applied in each case and the sections of the Fault Location part. With the aid of the circuit diagrams, the supply voltages (in the case of transistors: collector, base, emitter voltages, as well as dc voltages for relays and Zener diodes) must be measured and compared with the data specified in the circuit diagram. Unless specified otherwise, ac voltages must be measured with the RF Multizet meter and dc voltages with the

/uA-Multizet meter. If a component part that has been identified as being the source of trouble, is replaced by a new one, a correction of the frequency response, the modulator symmetry, the oscillator frequency or the gain may possibly be required. If,during fault location, several transistors or diodes are removed, ensure that, after the check, they are reinserted into the same places in the subassembly provided they are in good operating condition.

Note: - If the encountered fault is assumed to be in the filters or oscillators, never change the setting of the coil cores but check the terminals, soldered points etc. If, a fault cannot be located unambiguously in a subassembly by reference to the Fault Elimination part, or if the means required for fault elimintation are not available, the faulty subassembly can be replaced without loss of time. (Order a replacement subassembly from the factory).

2.2.3 Replacing the Scale Film

The film drive is of rugged construction and requires no maintenance. The film tape which carries the scale graduation, individually applied by a photographic process, also consists of particularly strong and durable plastic special foil for the purpose of ensuring greatest accuracy in setting the frequency. Under normal conditions trouble need thus not be anticipated. Should nevertheless a fault occur, take down the film cassette and replace the film, following the instructions given below. Never attempt to move the drive by using force.

A spare film and a negative film for the f_1 and f_2 scales are supplied with each unit. They are in a hermetically welded plastic bag and attached to the inside of the equipment above the instrument. After removing the upper cover plate, the corresponding spare film box (f_1 or f_2) can be screwed off and opened. The spare film must be inserted in accordance with the instructions given below; and the negative film forwarded to the works for making a new spare film. The customer will then receive a hermetically welded bag

from the works with spare and negative film. This must again be attached to the same place inside the equipment.

2.2.3.1 Taking Down the Film

For this purpose, the hexagon socket spanner (1.5 DIN 911), delivered in the spare parts bag, is required (see Maintenance part, 1.3).
Remove the lamp caps.
Unscrew the film drive knobs with the hexagon socket spanner, unscrew the front panel.

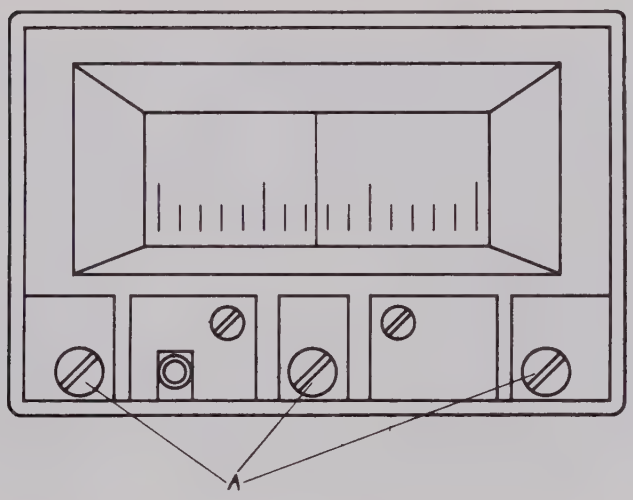


Fig. 1 Film guide

Slacken fixing screws (A) of the film guide and pull out the film guide towards the front (Fig. 1).
Wind film completely on the roller C and detach adhesive strip from roller D (Fig. 3).
Unwind film from roller C and detach adhesive strip from roller C. Carefully remove any residual adhesive from the roller.

2.2.3.2 Inserting the New Film

The spare film must be rolled in such a manner that the lettering for the high frequencies is legible from the outside. First remove dust particles from the film guide with a soft brush, then proceed as follows:
Grip roller C, turn sprocket roller E four turns counter-

clockwise (the equalizing spring in roller C is tensioned during this process) and lock it in this position by tightening the set screw F with the hexagon socket spanner Fig. 4.
Attach adhesive strip (40 mm x 15 mm), e.g. "Tesafilm D" adhesive strip, order No. 5859, Messrs. Beiersdorf, Hamburg, on to the legible end of the film in such a manner that 15 mm are left projecting (Fig. 2).
Cement end of film to roller C (Fig. 2). After cementing the edge of the film must be parallel with the edge of the roller.
Wind the film tightly onto roller C (Fig. 3) and hold it until the set screw F is loosened.
Thread end of film (beginning of scale) only as far through the bearing support and opposite piece, until it can be tautly cemented onto roller D.
Cement film onto roller D as described for roller C (Fig. 3).
Slacken set screw F (Fig. 4). The spring tension must now take effect. If roller C is gripped and sprocket roller E (see Fig. 2) is given a quarter turn anticlockwise, the sprocket roller must return to its initial position when released.
Turn one of the sprocket rollers until the first unlettered scale division coincides exactly with the index mark in the scale window. (This mark designates the mechanical stop of the film drive).
The film drive must be at the left-hand end stop.
Insert film guide carefully without exerting pressure and ensure that the film perforations engage the sprocket pins.
Uniformly tighten the three fixing screws (A) of the film guide.
The film guide must be so set that it can be turned smoothly and continuously without clicking noise.
Connect a frequency counter corresponding to the exchanged scale to jack "G" in the case of frequency scale f_1 and to jack "J" in the case of frequency scale f_2, check and if required read just the frequency scale according to the Notes on Maintenance, section 1.2.
Remount the front panel, the film guide knobs and the lamp cap.

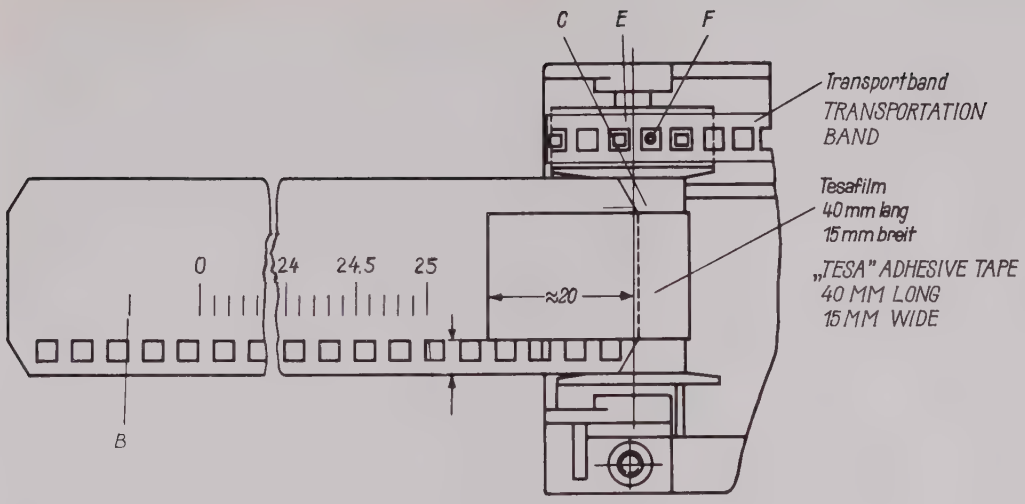


Bild 2 Ankleben des Filmband-Endes
FIG.2 CHEMENTING THE END OF THE FILM BAND IN POSITION

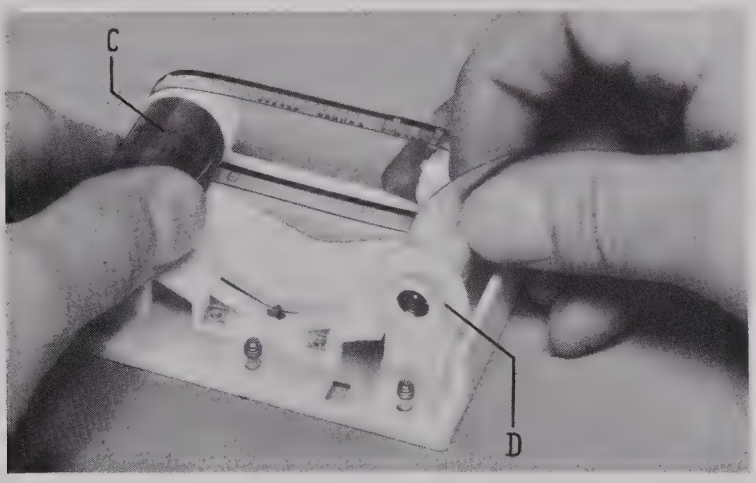


Bild 3 Ankleben des Filmband-Anfangs
FIG.3 CHEMENTING THE START OF THE FILM BAND IN POSITION

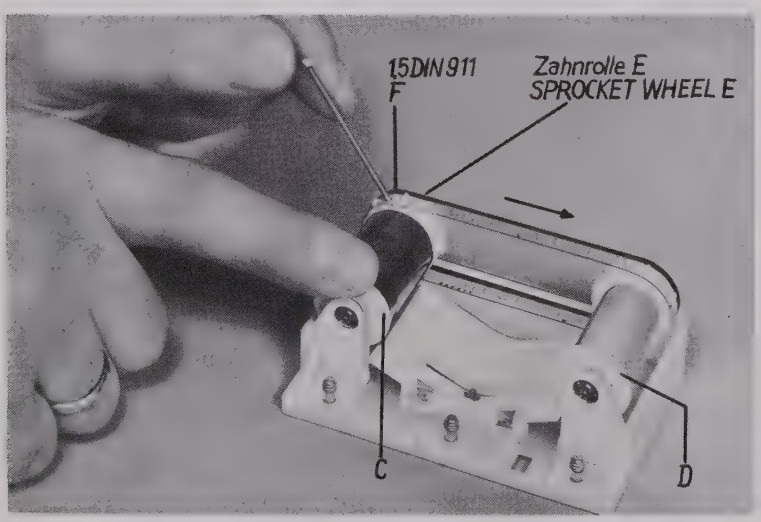


Bild 4 Lösen der Vorspannungs-Arretierung
FIG.4 RELEASING THE DETENT OF THE MECHANICAL BIAS

2.3 FAULT LOCATION TABLE

The fault location table indicates the fault location plans to be referred to in each case as well as the sections of the Fault Elimination part according to which the fault can be located and eliminated.

Type of fault	Fault location
2.3.1 Nominal value at jack II on the left and jack II on the right is not correct.	According to section 2.4.1, fault location plan No. 1
2.3.2 Incorrect nominal value at jack I left and jack I right.	According to section 2.4.2, fault location plan No. 2
2.3.3 Nominal value at jack III on the left and jack III on the right is not correct.	According to section 2.4.3, fault location plan No. 3
2.3.4 Nominal value at jack 3 is not correct.	According to section 2.4.4, fault location plan No. 4
2.3.6 Nominal value at jack J "Sweep oscillator" is not correct.	According to section 2.4.5, fault location plan No. 5
2.3.7 Nominal value at jack G "Sweep oscillator" is not correct.	According to section 2.4.7, fault location plan No. 7

2.3.8 Frequency lock-in f1 fails, lamp "Lock-in check nx 0.1 MHz" does not light up.	According to section 2.4.2, fault location plan No. 2
2.3.9 Frequency lock-in f1 fails, lamp "Lock-in check nx 0.1 MHz" lights constantly or independently of the frequency setting.	According to section 2.4.2, fault location plan No. 2
2.3.10 Frequency lock-in f1 is not stable, lamp "Lock-in check nx 0.1 MHz" flickers.	According to section 2.4.2, fault location plan No. 2
2.3.11 Frequency scale f1 "Tuning with lock-in" does not agree with the individual lock-in points nx 0.1 MHz.	Check the 1-MHz standard frequency in G5001. See section 2.5.1.6 to 2.5.1.8 of the Fault Elimination G5001. If necessary, reset the film scale. See notes on maintenance, section 1.2.1
2.3.12 Lock-in and holding range of the frequency lock-in system nx 0.1 MHz is too narrow.	According to section 2.4.2, fault location plan No. 2. If necessary, check the subassembly G5008 according to section 2.5.4
2.3.13 Frequency error with the frequency locked-in at nx 0.1 MHz exceeds $\pm$ 1×10^{-6}.	Check the 1-MHz standard frequency in G5001. See section 2.5.1.6 to 2.5.1.8 of the fault elimination on G5001.
2.3.14 Frequency error in tuning of f1 is continuously > 20 kHz.	Check whether the fo1-oscillator "with lock-in" is operating satisfactorily. If this

	is the case, proceed according to Fault Elimination on G5008, section 2.5.4, Resetting facility according to section 2.5.4.4.4 in G5008.
2.3.15 Frequency lock-in f2 fails. Lamp "Lock-in check nx 1kHz" does not light up.	According to section 2.4.3 fault location plan No. 3
2.3.16 Frequency lock-in f2 fails. Lamp "Lock-in check nx 1 kHz" lights constantly or independently of the frequency setting.	According to section 2.4.3 fault location plan No. 3
2.3.17 Frequency lock-in f2 is not stable. Lamp "Lock-in check nx 1 kHz" flickers.	According to section 2.4.3, fault location plan No. 3
2.3.18 Frequency scale f2 does not agree with the individual lock-in points nx 1 kHz.	Check the standard frequency in G5001 section 2.5.1.6 to 2.5.1.8. Reset the film scale according to section 1.2.2. If necessary, proceed according to section 2.5.7
2.3.19 Lock-in and holding range of the frequency lock-in nx 1 kHz is too narrow.	According to section 2.4.3, fault location plan No. 3. If necessary, check the subassembly G5014 according to section 2.5.7.
2.3.20 With the frequency locked in at nx 1 kHz, frequency error exceeds $\pm$ 1×10^{-6}.	Check the 1-MHz standard frequency in G5001. See section 2.5.1.6 to 2.5.1.8 of the fault elimination on G5001.

2.3.21 Frequency error of f2 exceeds ±30 Hz in the continuous tuning mode.	Check whether the fo2-oscillator is operating satisfactorily in the "locked-in" mode. If this is the case, proceed in G5014 according to section 2.5.7 of the Fault Elimination part. Resetting facility according to section 2.5.7.4.7 in G5015.
2.3.22 Frequency indication of the Hz-scale is not stable (apart from the frequency indication of 500 Hz ± approx. 5 Hz).	Check whether the fo2-oscillator is operating satisfactorily in the "locked-in" mode. If this is the case, proceed in G5014 according to section 2.5.7 of the Fault Elimination part.
2.3.23 0-Hz calibration can no longer be carried out. The potentiometer P1 has no influence or the regulating range is not sufficient.	Check whether the fo2-oscillator is operating satisfactorily in the "locked-in" mode. If this is the case, proceed in G5014 according to section 2.5.7 of the fault elimination. If necessary, recheck potentiometer P1 and the diodes Gr6, Gr7 and Gr2 in G5015.
2.3.24 In operation without lock-in (button T2 is released), the lamp "Lock-in check nx 1 kHz" lights constantly, e.g. independently of the frequency setting.	Check whether the fo2-oscillator is operating satisfactorily in the "locked-in" mode. If this is the case, proceed in G5014 according to section 2.5.7 of the Fault Elimination part.

2.3.25 In operation with "internal" 1-MHz standard frequency, with button T4 released, the pilot lamp Lp4 does not light up. Otherwise the unit operates satisfactorily.	Check the pilot lamp Lp4 and transistor Ts5 in the subassembly G5001. Recheck dc voltage V = +24 V at resistor R3.
2.3.26 In operation with "external" 1-MHz standard frequency, with button T4 pressed, the pilot lamp Lp4 does not light up and the unit is defective.	Check whether the unit performs satisfactorily in operation with "internal" 1-MHz standard frequency. If this is the case, proceed in G5001 according to section 2.5.1 of the Fault Elimination part.

2.4 FAULT LOCATION PLANS

The equipment is composed of easy-to-exchange, plug-in subassemblies. Even with the wide variety of the individual subassemblies, fault location can be carried out without much effort since the input and output signals of each satisfactorily operating subassembly have well-defined and often equal level values. For instance, all carrier voltages with the 0-dBm line level are passed to the modems at 75 Ω (this corresponds to a voltage level of -9.04 dB or a voltage of 274 mV).

In this way, inadmissible deviations of the nominal values can be rapidly detected and defective subassemblies accordingly replaced without loss of time.

By reference to the fault location plans, a defective subassembly or a trouble in the equipment cabling can be found out. In the case of frequency measurements always synchronize the frequency counter with the 1-MHz standard frequency coming from jack 3 of the frequency generator G2021.

2.4.1 Fault Location Plan No. 1

2.4.1.1 Nominal value at Jack II on the Left and Jack II on the Right is not Correct

Nominal value: Pulse voltage V = 1.2 V_{ss} ± 0.2 V, ⎍⎍ 100 kHz at the 75 Ω terminal.

2.4.1.2 Basic Setting of the Equipment

f1 = 0 MHz with lock-in, f2 = 0 kHz with lock-in, button T4 is released. Even if the oscillators fail to lock-in, carry out the following checking measurements in sequential order.

2.4.1.3 Checking the Subassembly G5001

Connect the subassembly to the equipment via an adapter.
Pulse voltage at pin 20 V = approx. 1 V_{pp} at 75 Ω,

$$f = 1 \text{ MHz} \pm 1 \times 10^{-6}$$

Pulse voltage at pin 14 V = 5 V_{pp}, ⎍⎍ 1 MHz $\pm 1 \times 10^{-6}$

When the nominal value is reached, check the subassembly G5002 according to section 2.4.1.4.
If the nominal value is not reached, continue checking the subassembly G5001.

DC Voltages

At pin 2 V = + 24 V
At pin 6 V = + 14 V (button T4 is released, Lp4 lights)
At pin 10 V = + 24 V
If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check cabling, lamp Lp4, button T4.
If the dc voltage is present, proceed in G5001 according to section 2.5.1 of the Fault Elimination part.

2.4.1.4 Checking the Subassembly G5002

Connect the subassembly to the equipment via an adapter.
Pulse voltage at pin 28 V = 2 V_{pp}, ⎍⎍ 100 kHz ± 1 x 10^{-6}.

When the nominal value is achieved, check the subassembly G5007 in G5003 according to section 2.4.1.5.
If the nominal value is not reached, continue checking subassembly G5002.

DC Voltage
At pin 2 V = + 24 V
AC Voltage
At Pin 13-14 V = approx. 9 V

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check the cabling.

Pulse Voltage
At pin 5 V = 5 V_{pp}, ⎍⎍ 1 MHz $\pm$ $1x10^{-6}$

If the pulse voltage is not present at pin 5, check the cabling to subassembly G5001, pin 14.
If the dc and pulse voltages are present, then proceed in G5002 according to section 2.5.2.

2.4.1.5 Checking the Subassembly G5007 in G5003

DC Voltages
At pin b3 V = + 23 V
At pin a3 V = + 24 V

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check cabling and resistance R1 = 47 Ω.

Pulse Voltage
At pin a4 V = 2 V_{pp}, ⎍⎍ 100 kHz $\pm 1x10^{-6}$

If the pulse voltage is not present, check the cabling to subassembly G5002, pin 28.
If the pulse voltage is present at pin a4 proceed according to section 2.5.3 fault elimination on G5003 or 2.5.3.5 on G5007.

2.4.2 Fault Location Plan No. 2

2.4.2.1 Incorrect nominal value at jack I left and jack I right

~ = 0 dBm IN 75Ω

Nominal value: AC voltage V = 274 mV ± 10 % at the 75-Ω terminal, f = 45 MHz ± $1x10^{-6}$ with the frequency locked-in at f_1 = 0 MHz.

2.4.2.2 Basic Setting on the Equipment

f1 = 0 MHz with lock-in, f2 = 0 kHz with lock-in, button T4 is released. Even when the oscillators fail to lock-in, carry out the following check measurements in sequential order.

2.4.2.3 Checking the Subassembly G 5001

Connect the subassembly to the equipment via an adapter.
Pulse voltage at pin 14 V = 5 V_{pp}, ⎍⎍ 1 MHz ± $1x10^{-6}$.
If the nominal value is reached, check subassembly G5002 according to section 2.4.2.4.
If the nominal value is not reached, continue checking subassembly G5001.

DC Voltages

At pin 2 V = + 24 V
At pin 6 V = + 14 V (button T4 is released, Lp4 lights)
At pin 10 V = + 24 V

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check cabling, lamp Lp4, button T4.
Pulse voltage at pin 20
V = approx. 1 V_{p-p}, f = 1 MHz ±$1x10^{-6}$ at 75-Ω termination.

If the dc voltage is present, then proceed in G5001 according to section 2.5.1.

2.4.2.4 Checking the Subassembly G5002

Connect the subassembly to the equipment via an adapter.
Pulse voltage at pin 26 V = 2 V_{pp}, ⎍⎍ 100 kHz ± $1x10^{-6}$.
If the nominal value is reached, check subassembly G5008 according to section 2.4.2.6.
If the nominal value is not reached, continue checking

subassembly G5002.

DC Voltage

At pin 2 V = + 24 V

AC Voltage

At pin 13-14 V = approx. 9 V

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Recheck the cabling.

Pulse Voltage

At pin 5 V = 5 V_{pp}, ⎍ 1 MHz ± $1x10^{-6}$

If no pulse voltage is present at pin 5, check the cabling to subassembly G5001 pin 14.
If the dc and pulse voltages are present, then proceed in G5002 according to section 2.5.2.

2.4.2.5 Checking the Subassembly G5020

Connect the subassembly to the equipment via an adapter. Unscrew the shielding cover.

AC Voltage

At jack 1 V = 274 mV ± 10 %, f = 41.6 MHz ± $1x10^{-6}$

If the nominal value is not reached, continue checking subassembly G5020.

DC Voltage at G5021/G5022

At pin a5 V = + 24 V (G5021)
At pin a5 V = + 24 V (G5022)

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024.

AC Voltage at G5021

At jack 1 V = 274 mV ± 10 %, f = 41.6 MHz ± $1x10^{-6}$

Pulse Voltage at G5022

At pin a8 V = 2 V_{pp}, ⎍ 100 kHz ± $1x10^{-6}$

If the pulse voltage is not present at pin a8, check the

cabling to subassembly G5002, pin 26.
If the dc and pulse voltages are present, then proceed in G5020 according to section 2.5.9.

2.4.2.6 Checking the f0-Oscillator Subassembly G5008

Remove the "sweep oscillator" short-circuit link G-H, terminate jack G into 75-Ω and check the nominal value.

AC Voltage

At jack G V = 274 mV ± 10 %, f = 45 MHz ± 1×10^{-6}
(f1 = 0 MHz locked-in)

If the nominal value is reached, check subassembly G5006 in G5003 according to section 2.4.2.9.
If the nominal value is not reached, continue checking subassembly G5008.

DC Voltages at G5010 and 5011

At pin a5 V = + 24 V
At pin a8 V = + 24 V (button T1 is released)

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check the cabling.

Pulse voltage at G5011

At pin a3 V = 2 V_{pp}, ⎍ 100 kHz ± 1×10^{-6}

If the pulse voltage is not present at pin a3, recheck the cabling to subassembly G5002, pin 26.
If the dc voltage and pulse voltage are present check the subassembly G5012 (f1-buffer stage) according to section 2.4.2.7.

2.4.2.7 Checking the Subassembly G5012 (f1-buffer stage)

Connect the subassembly to the equipment via an adapter. Remove the shielding cover.

DC Voltage

At pin a5 V = + 24 V
If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check the cabling.

AC Voltage

At jack 9 V = 274 mV ± 10 %, f = 45.0 MHz ± 1×10^{-6}
At jack 1 V = 274 mV ± 10 %, f = 45.0 MHz ± 1×10^{-6}

If the ac voltage is missing at jack 9 check the cabling to subassembly G5010 jack 2 and, if necessary, check subassembly G5010 according to section 2.5.4.2.1.
If the ac voltage is missing at jack 1, check subassembly G5012 (f1-buffer stage) according to section 2.5.5.
If the nominal value at jack "G" cannot be reached check subassembly G5008 according to section 2.5.4 fault elimination on G5008. If the nominal value is reached at jack "G" but the lock-in pilot lamp Lp2 nx 0.1 MHz fails to light (or lights continously or independently of the frequency setting) then continue the check of G5012 (F1 lock-in indication) according to section 2.4.2.8.

2.4.2.8 Checking Subassembly G5012 (f1-lock-in indication)

Connect the subassembly to the equipment via an adapter.
Unscrew the shielding cover.

DC Voltages

At pin a8 V = + 2.5 V (button T1 is pressed, Lp2 lights)
At pin a5 V = + 24 V

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check cabling, lamp Lp2, R2 = 120 Ω, D-relay and button T1.
A dc voltage of V = + 3 V ± 0.6 V must be present at pin b7.
If the nominal value is not reached, check the cabling to subassembly G5011 in G5008 pin b7. If the voltage is present, then proceed in G5012 (f1-lock-in indication) according to section 2.5.5.2 and 2.5.5.3 of the fault elimination.

2.4.2.9 Checking the Subassembly G5003

Unscrew the shielding cover. Link G-H "Sweep oscillator" is inserted.

DC and AC Voltages at Subassembly G5006 (f1 = 0 MHz locked-in)

At pin a3 dc voltage V = + 24 V
At jack 1 ac voltage V = 274 mV ± 10 %, f = 45 MHz $\pm 1 \times 10^{-6}$

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check the cabling.
If the ac voltage is not present at jack 1, check the cabling

to jack "H" and the link "Sweep oscillator".
If the ac voltage is present at jack 1, then proceed in G5003 according to section 2.5.3.

2.4.3 Fault Location Plan No. 3

2.4.3.1 Nominal Value at Jack III on the Left and Jack III on the Right is not Correct

Nominal value: AC voltage V = 274 mV ± 10 % at the 75-Ω terminal, f = 42.6 MHz ± $1x10^{-6}$ with the frequency locked in at f_2 = 0 kHz.

2.4.3.2 Basic Setting on the Equipment

f1 = 0 MHz with lock-in, f2 = 0 kHz with lock-in, button T4 is released. Even when the oscillators do not lock-in, carry out the following checking measurements in sequential order.

2.4.3.3 Checking the Subassembly G5001

Connect the subassembly to the equipment via an adapter.
Pulse voltage at pin 14 V = 5 V_{pp}, ⌐⌐ 1 MHz ± $1x10^{-6}$.
If the nominal value is reached, check subassembly G5002 according to section 2.4.3.4.
If the nominal value is not reached, continue checking subassembly G5001.

DC Voltages

At pin 2 V = + 24 V
At pin 6 V = + 14 V (button T4 is released, Lp4 lights)
At pin 10 V = + 24 V

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check cabling, lamp Lp4, button T4.

Pulse voltage

at pin 20 V = ∼1V_{ss}, f = 1 MHz ± $1x10^{-6}$ at the 75 Ω terminal.

If the dc voltage is present, then proceed in G5001 according to section 2.5.1 of the Fault Elimination part.

2.4.3.4 Checking the Subassembly G5002

Connect the subassembly to the equipment by means of an adapter. Pulse voltage at pin 21 V=5.5 V_{pp}, ⎍⎍ 1 kHz $\pm 1 \times 10^{-6}$.
If the nominal value is reached, check subassembly G5014 according to section 2.4.3.5.
If the nominal value is not reached, continue checking subassembly G5002.

DC Voltages
At pin 2 V = + 24 V
AC voltage
At pin 13-14 V = approx. 9 V
If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check the cabling.

Pulse Voltage
At pin 5 V = V_{pp}, ⎍⎍ 1 MHz $\pm$ 1×10^{-6}

If the pulse voltage is not present at pin 5, check the cabling to subassembly G5001, pin 14.
If the dc and pulse voltages are present, then proceed in G5002 according to section 2.5.2 of the Fault Elimination part.

2.4.3.5 Checking the f02-Oscillator Subassembly G5014

Remove the J-K "sweep oscillator" link and terminate jack J into 75 Ω.
AC Voltage at jack J
V = 274 mV $\pm$10 %, f = 1 MHz $\pm 1 \times 10^{-6}$ (f2 = 0 kHz locked-in)
If the nominal value is reached insert the J-K "sweep oscillator" link and check G5017 according to section 2.4.3.6. If the nominal value is not reached continue the check of G5014.

DC and Pulse Voltages at Subassembly G5016
Pulse Voltage
At pin a3 V = 5.5 V_{pp}, ⎍⎍ 1 MHz $\pm$ 1×10^{-6}

If the pulse voltage is not present, check the cabling to subassembly G5002 pin 21.

DC Voltage

At pin b5 V = + 24 V (lamp Lp3 does not light up)
At pin a5 V = + 24 V
At pin a8 V = + 24 V
At pin b8 V = + 24 V
At pin b7 V = + 4.8 V

If the dc voltage is not present at pin b5, a5, a8, b8 measure the dc voltage at pin b10/12 in the power supply D5024.

Recheck cabling, lamp Lp3, resistor R4, R5, R6, capacitor C1, E-relay and button T2.

DC Voltages at Subassembly G5015

At pin b6 V = + 4.8 V
At pin a4 V = + 24 V
At pin b4 V = 0 V (voltage +24V is only present when button T2 is released)
At pin a7 V = + 2 V (P1 left-hand stop)
At pin a7 V = +20 V (P1 right-hand stop)

If the dc voltage is not present at pin b6, check whether V = +4.8 V is present at pin b7 in G5016. If this is the case, then proceed in G5023 according to section 2.5.10 of the Fault Elimination part.
If the dc voltage is not present at pin a4, b4, remeasure it at pin b10/12 in the mains section D5024. Check cabling and button T2.
If the voltage is not present at pin a7, measure the dc voltage at pin b10/12 in the power supply D5024. Check potentiometer P1 and cabling. Check the Zener diodes Gr6 and Gr7 in subassembly G5015. If the dc and pulse voltages are present, then proceed in G5014 according to section 2.5.7 of the Fault Elimination part.

2.4.3.6 Checking the Subassembly G5017 (f2 = 0 kHz locked-in)

J-K "sweep oscillator" link is inserted.
Connect the subassembly to the frequency generator via an adapter. Unscrew the shielding cover, shield the oscillator subassembly G5018 with a test cover.

Level at jack 1 V = 274 mV ± 10 %, f = 42.6 MHz ± $1x10^{-6}$
If the nominal value is reached, check subassembly G5006 in G5003 according to section 2.4.3.7. If the nominal value is not reached, continue checking subassembly G5017.

DC Voltage at Subassembly G5019 and G5018

At pin a5 V = + 24 V (G5019)

At pin a5 V = + 24 V (G5018)

If the dc voltage is not present, measure it at pin b10/12 in the power supply D5024. Check the cabling.

AC Voltage at Subassembly G5019

At jack 9 V = 274 mV ± 10 %, f = 1 MHz ± $1x10^{-6}$

If the ac voltage is not present at jack 9, recheck the cabling leading to subassembly G5014 jack 1 via the link K-J "Sweep Oscillator".

AC Voltage at Subassembly G5018

At jack 9 V = 274 mV ± 10 %, f = 41.6 MHz ± $1x10^{-6}$

If the ac voltage is not present at jack 9, check the cabling to subassembly G5021 in G5020, jack 1. If necessary, proceed according to sections 2.4.2.3 to 2.4.2.5 of the fault location plan No. 2.
If the dc and ac voltages are present, then proceed in G5017 according to section 2.5.8 of the Fault Elimination part.

2.4.3.7 Checking the Subassembly G5006 in G5003

DC Voltage

At pin b3 V = + 24 V

If the dc voltage is not present, measure the dc voltage at pin b10/12 in the power supply D5024. Check cabling and resistance R1 = 47 Ω .

AC Voltage

At jack 5 V = 274 mV ± 10 %, f = 42.6 MHz ± $1x10^{-6}$

If the ac voltage is not present, check the cabling to subassembly G5017 jack 1.
If the ac voltage is present, then proceed in G5003 according to section 2.5.3.2 and 2.5.3.4 of the Fault Elimination part.

2.4.4 Fault Location Plan No. 4

2.4.4.1 Nominal Value at Jack 3 is not Correct

Nominal value: Pulse voltage is approx. 1 V_{p-p} at the 75-Ω terminal, f = 1 MHz ± $1x10^{-6}$

2.4.4.2 Basic Setting of the Equipment

According to section 2.4.1.2 (fault location plan No. 1).

2.4.4.3 Checking the Subassembly G5001

Connect the subassembly to the frequency generator via an adapter.

Pulse voltage at pin 20 V = approx. 1 V_{p-p} across 75 Ω
f = 1 MHz ±$1x10^{-6}$

If the nominal value is not reached, continue the check of G5001.

DC voltages

At pin 2 V = +24 V

At pin 6 V = +14 V (button T4 released, Lp 4 lights)

At pin 10 V = +24 V

If the dc voltage is missing, measure the dc voltage at pin b10/12 in power supply D5024. Check the cabling, lamp Lp4 and button T4.

If the dc voltage is present, proceed according to section 2.5.1. fault location on G5001.

2.4.5 Fault Location Plan No. 5

2.4.5.1 Incorrect nominal value at jack J "sweep oscillator"

Nominal value: AC voltage V = 274 mV ± 10 % at 75 Ω
f = 1.0 MHz ± $1x10^{-6}$ with the frequency locked in at f_2 = 0 kHz.

2.4.5.2 Basic Setting of the Equipment

According to section 2.4.3.2 (fault location plan No. 3).

2.4.5.3 Checking the Subassembly G5001

According to section 2.4.3.3 (fault location plan No. 3).

2.4.5.4 Checking the Subassembly G5002

According to section 2.4.3.4 (fault location plan No. 3).

2.4.5.5 Checking the Subassembly G5014

According to section 2.4.3.5 (fault location plan No. 3).

2.4.7 Fault Location Plan No. 7

2.4.7.1 Nominal Value at Jack G "Sweep Oscillator" is not Correct

Nominal Value: AC voltage V = 274 mV ± 10 % at 75 Ω,
f = 45 MHz ± 1×10^{-6} with the frequency locked in at f_1 = 0 MHz.

2.4.7.2 Basic Setting of the Equipment

According to section 2.4.2.2 (fault location plan No. 2).

2.4.7.3 Checking the Subassembly G5001

According to section 2.4.2.3 (fault location plan No. 2).

2.4.7.4 Checking the Subassembly G5002

According to section 2.4.2.4 (fault location plan No. 2).

2.4.7.6 Checking the Subassembly G5008

According to section 2.4.2.6 (fault location plan No. 2).

2.4.7.7 Checking the Subassembly G5012 (f1 buffer stage)

According to section 2.4.2.7 (fault location plan No. 2).

2.4.7.8 Checking the Subassembly G5012 (f1 lock-in indication)

According to section 2.4.2.8 (fault location plan No. 2).

2.5 FAULT ELIMINATION

Notes on Fault Elimination

When a defective subassembly has been found out by reference to a fault location plan, it must first be subjected to a

visual inspection. Overloaded resistors and coils can often be recognized by their changed color (burned). Before replacing such components, the source of the fault must be first clearly determined and eliminated, e.g. check a following transistor, diode or capacitor for a short circuit. In order to provide the oscillatos G5008, G5014, G5017 and G5020 with the frequency stability and accuracy of a high-quality crystal oscillator, these oscillators are corrected to the accuracy of the internal 1-MHz standard frequency via a frequency regulating loop. To avoid measurement errors, the frequency counter must therefore be synchronized with the 1-MHz standard frequency of the frequency generator G2021 (jack 3, at the rear of the frequency generator G2021) in the case of frequency measurements.

In the case of frequency errors of the f1, f2 or Hz scales, the frequency accuracy of the standard frequency of f = 1 MHz ± 0.5 Hz must be principally checked before carrying out further checks. See Notes on Maintenance section 1.1, correcting the "1-MHz Standard Frequency". For fault elimination, the subassembly must be connected to the frequency generator by means of an adapter as in the case of fault location.

2.5.1 Fault Elimination on the fo-oscillator G5001

2.5.1.1 Measuring Instruments Required

1 oscilloscope (rise time $\leq$ 50 ns) e.g. Siemens Oszillar M214 with probe divider 10:1

1 frequency counter, $\frac{\Delta f}{f} \leq 1 \times 10^{-7}$

1 level oscillator W231

1 µA-Multizet meter

1 75-Ω termination

2.5.1.2 Input Current

For the time being, the voltage is not applied, i.e. no voltage at pin 9/10 (button T4 is pressed).

When applying the operating voltage, the input current of the subassembly, measured at pin 1/2, must be I = 140 mA ±

8 mA (subassembly is not warmed up, crystal even has a full power input).
Now apply relay voltage (button T4 is released).
The input current of the subassembly must increase by I = 11 mA ± 2 mA, the incandescent lamp Lp4 must light and the input current must be I = 43 mA ± 5 mA at pin 5/6.

2.5.1.3 Zener Voltages

The Zener voltage must be measured when the relay voltage of + 24 V is applied to pin 9/10 (button T4 is released):

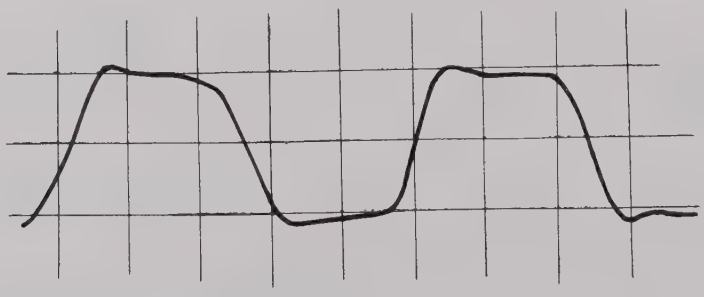
Zener Diode	U_Z
V_{Gr1}	11.4 to 12.6 V
V_{Gr2}	7.4 to 8.6 V

2.5.1.4 Checking the Crystal Oscillator

The relay voltage remains applied (button T4 is released), the frequency counter is connected to jack 3.
The oscillation frequency of the oscillator should amount to f = 1 MHz ± 0.2 Hz. If required, align according to section 2.5.1.8.

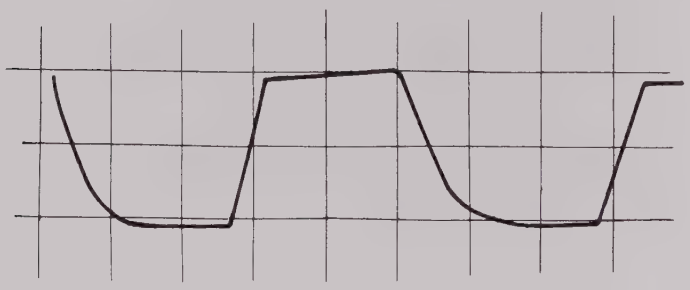
2.5.1.5 Checking the Output Voltage

Connect the oscilloscope (X:0.2 ms/cM Y:0.05 V/cm) to pin 20/21 and chassis ground (pins 26 to 29) via the probe (1:10). Terminate Bu 3 into 75 Ω.
The oscilloscope must display the following pattern:



Press button T4.
Lamp L4 goes out.
Oscilloscope display disappears.
Connect the oscilloscope (X:0.2 ms/cm Y:0.2 V/cm)

to pin 13/14 and chassis ground via the probe (1:10)
No display on the oscilloscope (T4 is down).
Release T4.
Lamp L4 lights.
The oscilloscope must display the following pattern.



Feed f = 1 MHz (locked-in) into jack 3 of G2021 with a signal generator level = +3 dB; Z = 75 Ω.
Press button T4.
Lamp L4 lights.
The oscilloscope must display the above pattern, however $V_{p-p} \leqq 6$ V.

2.5.1.6 Frequency Setting

This and the following settings and measurement may be carried ount only after a warm-up time of the subassembly of approx. 60 min. (thermal equilibrium).

Relay voltage is applied (button T4 is released), connect the frequency counter to jack 3.

2.5.1.7 Checking the Pulling Range

The pulling range must be checked when the trimmer C9 is fully enmeshed and fully out of mesh (departure from 1 MHz).

(a) max. capacitance $\Delta f \leqq -4$ Hz
(b) min. capacitance $\Delta f \geqq +3$ Hz

2.5.1.8 Setting the Standard Frequency

Set the frequency to $f_o = 1$ MHz $\pm$ 0.2 Hz by using C9.
Subsequently, remove the supply voltage for approx. 1/2 min. After reapplication of the supply, the oscillations must build up, and the same frequency must result.

2.5.1.9 Checking the Crystal Oven Regulation

After a warm-up time of approx. 30 min., the input current

of the subassembly must be measured when the relay voltage is applied (button T4 is released).

The displayed value should be lower by approx. 15 mA than that measured under 2.5.1.2 (I = 140 mA ±8 mA).

2.5.2 Fault Elimination on Frequency Divider G5002-B

2.5.2.1 Measuring Instruments Required:

1 oscilloscope for up to 100 MHz, e.g. 100-MHz Siemens Oszillar M214 with probe divider 10:1

1 µA-Multizet meter

1 ac Multizet meter

2.5.2.2 Input current

At pin 1/2 I = 70 mA ± 5 mA

At pin 13 I = 90 mA ± 10 mA

2.5.2.3 Measuring the supply voltages

1 MHz pulses (⎍⎍) of approx. 5 V_{p-p} must appear at pin 5/6

Connect The

Connect the uA-Multizet meter to pin 1/2 against chassis ground

V = +24 V

Connect the ac Multizet meter to pin 13-14

V = approx. 9 V ac

2.5.2.4 Measuring the Pulse Amplitude and the Edge Steepness

Edge steepness is the time within which the pulse increases from 10 % to 90 % of the maximum amplitude. Carry out the measurements with a calibrated 10:1 probe.

2.5.2.5 100-kHz Output at Pin 26/27

Connect the oscilloscope to pin 26/27.

Oscilloscope: X = 2 µsec/cm Y = 0.1 V/cm

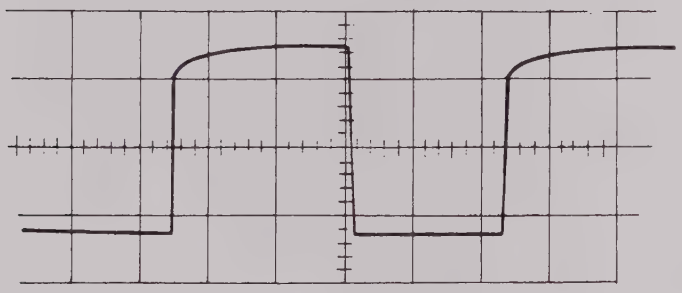


FIG 1
PIN 26/27

Oscilloscope: X = 0.1 µsec/cm Y = 0.1 V/cm
The rise time must be = 40 ns at 80 % of the maximum value.
The fall time must be $\leq$ 30 ns. Overshoot $\leq$ 110 mV

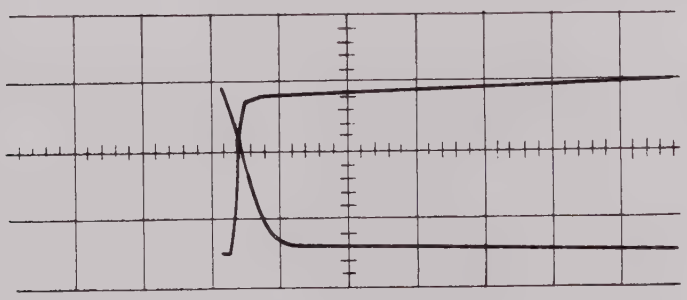


FIG 2
PIN 26/27

2.5.2.6 100-kHz output at pin 28/29

Connect the oscilloscope to pin 28/29.
Oscilloscope: X = 2 µsec/cm Y = 0.1 V/cm

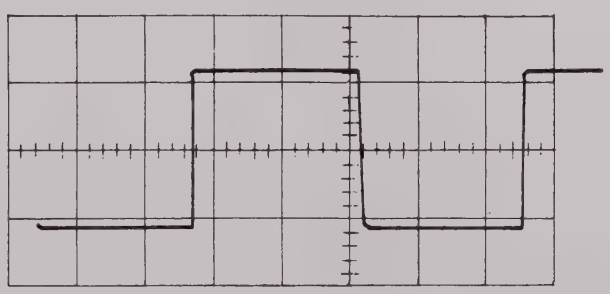


FIG 2.1
PIN 28/29

The rise time must be $\leq$ 80 nsec.
Overshoot $\leq$ 100 mV

2.5.2.7 1-kHz Output at Pin 20/21

Connect the oscilloscope to pin 20/21.

Oscilloscope: X = 0.2 msec/cm Y = 0.2 V/cm

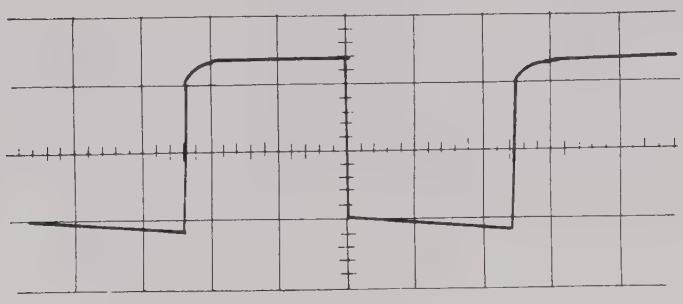


FIG 3
PIN 20/21

Oscilloscope: X = 200 ns/cm Y = 0.2 V/cm

The following trace must be displayed.

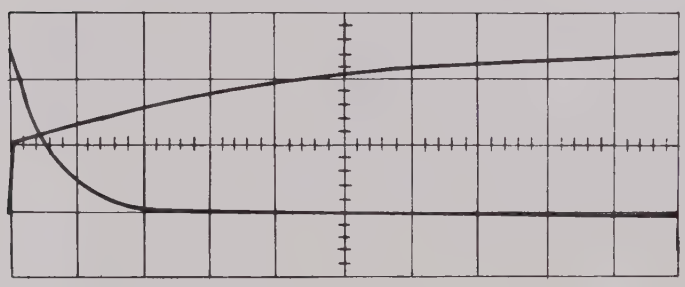


FIG 4
PIN 20/21

2.5.2.8 If the signals specified under 2.5.2.5, 2.5.2.6 and 2.5.2.7 are not met, check the imputs of the IC (pin 12).

I_1: 100-kHz output, pin 12

Oscilloscope: X = 2 μsec/cm Y = 0.2 V/cm

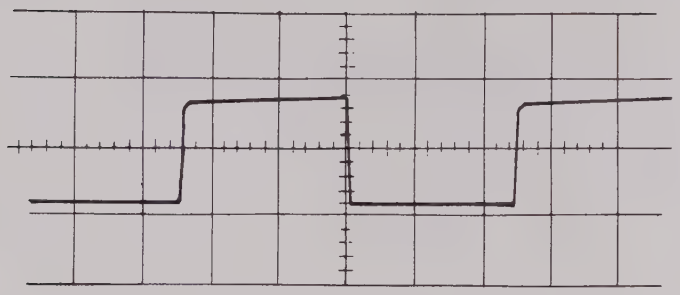


FIG 5

I_2: 10-kHz output, pin 12

Oscilloscope: X = 20 μsec/cm Y = 0.2 V/cm

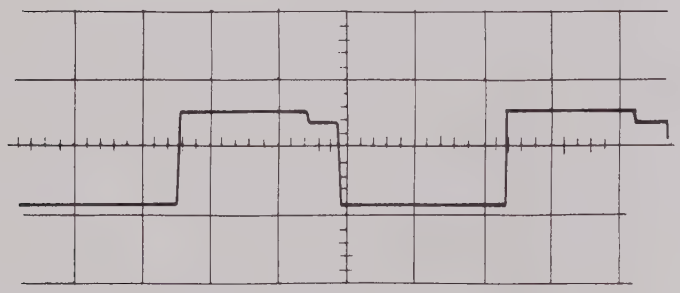


FIG 6

I_3: 1-kHz output, pin 12

Oscilloscope: X = 0.2 msec/cm Y = 0.2 V/cm

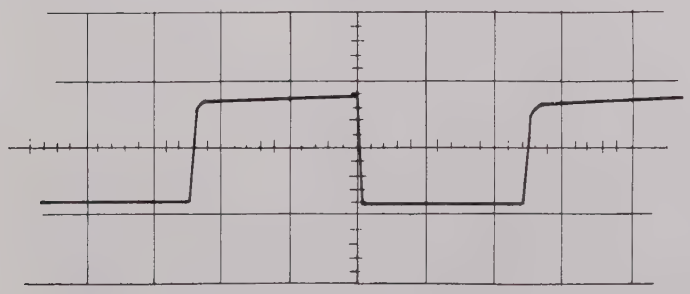


FIG 7

2.5.3 Fault Elimination on the Distributor Subassembly G5003

2.5.3.1 Measuring Instruments Required

1 oscilloscope of up to approx. 100 MHz, e.g. Siemens wideband Oszillar M214 with probe divider 10:1.
1 RF-Multizet meter
1 µA-Multizet meter
2 75-Ω termination.

2.5.3.2 Input Current

f1 locked in at 0 MHz, f2 at 0 kHz
Measure the input current (f_{01}-distributor) at plug 3a with a µA-Multizet meter (100-mA range)

$$I = 30 \text{ mA} \pm 5 \text{ mA}$$

Measure the input current (f_3 and 100-kHz distributor) at plug 3 b with µA-Multizet meter (100-mA range).

$$I = 30 \text{ mA} \pm 5 \text{ mA}$$

2.5.3.3 Checking the f_{01}-distributor G5006

Checking the gain:
f1 is locked in at 0 MHz. A voltage of approx. 280 mV and 45 MHz appears at jack 1 (measured at the solder terminal of the jack with RF-Multizet meter). Successively terminate the two output jacks I into 75 Ω and measure the output voltage at the solder terminal of each jack with an RF Multizet meter. It shall be between 270 mV and 300 mV. At the emitter of Ts2 V_{p-p} = approx. 1 V, at the emitter of Ts3 V_{p-p} = approx. 1 V.

Checking the frequency response:
f1 is locked in at 25 MHz. A voltage of approx. 280 mV and 70 MHz appears at jack 1 (measured at the solder terminal of the jack with an RF-Multizet meter). Terminate the two autput jacks I successively into 75 Ω and, in each case, measure the output voltage at the solder terminal of the jacks with an RF-Multizet meter. It shall be 270...300mV
If the frequency response is excessive, then short-circuit L1 with soldered link and recheck the frequency response.

2.5.3.4 Checking the f3-distributor G5006

f2 locked-in to 0 kHz.
An ac voltage of approx. 280 mV is present at jack 5 (f = 42.6 MHz).
Terminate the two output jacks III into 75 Ω and measure the output voltage at the solder terminal of each jack with an RF Multizet meter.It shall range between 270 mV and 300 mV.
V_{pp} = approx. 1 V at the emitter of Ts2 and V_{pp} = approx. 1 V at the emitter of Ts3.

2.5.3.5 Checking the 100-kHz Distributor G5007

A 100-kHz pulse of approx. 2 V_{pp} is present at plug 4a.
Terminate the two outputs II into 75 Ω simultaneously.
The output voltage shall be

$$V = 1\ V_{pp}\ ^{+\ 0.4}_{-\ 0.2}\ V$$

at the solder terminal of the output jacks when measured with an oscilloscope.

2.5.4 Fault Elimination on the fo1-oscillator G5008

2.5.4.1 Measuring Instruments Required

1 oscilloscope, e.g. Siemens Oszillar M214 with probe divider 10:1
1 level meter of approx. 100 MHz
e.g. Siemens broadband Oscillar M214
with 10:1 probe divider.
1 frequency counter of approx. 100 MHz
1 RF-Multizet meter
1 µA-Multizet meter
1 75-Ω termination

2.5.4.2 Note:

The oscillator G5009 operates with compensation of the temperature coefficient. Never change the setting of the temperature-compensating trimmer C16 in the oscillator. Should a frequency-determining component of the oscillator be replaced for the purpose of fault elimination, a new alignment of the

resulting temperature coefficient will be required and the film scale must be checked.
For resetting the film scale see Notes on Maintenance part, section 1.2.1.

2.5.4.2.1 Removing the fo1-oscillator

Remove the film drive knobs. For this purpose, use the hexagonal socket spanner (1.5 DIN 911) provided in the spare parts bag. Remove the lamp caps. Unscrew the front shield.
Remove the fastening screws at the bottom and from the front panel of the oscillator. Withdraw the oscillator towards the front and connect it via short connecting cords in the same way as in the equipment. Unscrew the shielding plates. Due to the removal of the shielding plates of the oscillator section, a shift of approx. 200 kHz in the oscillator frequency will result. This must be taken into account in fault location

fosz = 45 MHz corresponds to 0 MHz on the film scale f1.
fosz = 70 MHz corresponds to 25 MHz on the film scale f1.

2.5.4.3 Oscillator G5009 and Amplifier G5010

2.5.4.3.1 Input Current:

Measure the input current with a µA-Multizet meter (100-mA range)
At pin a5 I = 36 mA ± 5 mA.

Fault Location and DC Operating Points:
If the measured value is above or below the specified value or if the following check reveals the presence of a fault, the following dc voltages must be measured against chassis ground with a µA-Multizet meter:

Measuring point	14	Ts2-R23	Ts3-R26
V (in volts)	9.1 ± 0.5	16.8 ± 1	16.8 ± 1
Measuring range	10 V	30 V	30 V

2.5.4.3.2 Setting the Varactor Bias

Button T1 is released, set f1 to 12 MHz. The µA-Multizet meter (30-V range) must be connected to measuring point 9. The dc voltage must amount to 12 V ± 0.5 V. Effect alignment with R31.

2.5.4.3.3 Checking the Output Voltage

Measure the voltage with an RF-Multizet meter.
At jack 1 V = 274 mV ± 10 %
At jack 2 V = 274 mV ± 10 %
At pin 6 V = 400 mV ± 10 %

2.5.4.4 Regulating Section G5011

2.5.4.4.1 Input Current

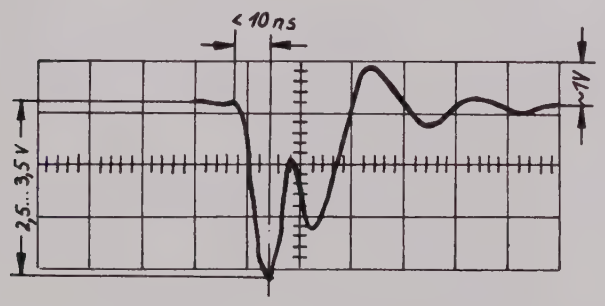
Measure the input current with a µA-Multizet meter (100-mA range)
At pin a5 I = 50 mA ± 5 mA

Fault location and dc operating points:
If the measured value is above or below the specified value or if the following check reveals the presence of a fault, the following dc voltages must be measured against chassis ground with a µA-Multizet meter:

Measuring point	Ts1-R11	Ts2-R15	Ts3-R30	13	Pin b7
V (V)	11 ± 1	11.3±1	9 ± 1	6±0.5	10 ± 1
Measuring range	30 V	30 V	10 V	10 V	30 V

2.5.4.4.2 Checking the Pulse Shaper:

Button T1 is pressed, connect the oscilloscope to R15-Gr4. The following pulse shape must appear:



2.5.4.4.3 Checking the Pulse Mixer:

Button T1 is released. Connect the frequency counter to jack 1 G5010 and set the f1 oscillator to f = 45,0005 MHz ± 50 Hz. Connect the oscilloscope to R54-C44 against chassis ground via the probe 10:1. The waveform must be sinusoidal (without limitation).

V_{pp} = approx. 800 mV

Checking the output stage:

Same frequency setting, however, the oscilloscope must now be connected to b7 against chassis ground (a7) via the probe. The waveform must remain sinusoidal, the amplitude may be lower by approx. 50 mV.

2.5.4.4.4 Checking the Frequency "With/without Lock-in"

Release button T1, connect the frequency counter to jack G "sweep oscillator". Set the frequency tuner f1 to the index line 15 MHz. The oscillator shielding plate must be firmly screwed on. Frequency display f = 60 MHz ± 5 kHz. Align with R51. Press button 1, the oscillator must lock-in, the lamp Lp2 nx 0.1 MHz lights. Align with R23. To check, measure the dc voltage against chassis ground at pin 2. When button T1 is released, the dc voltage at pin 1 must be approx. 3 V.

2.5.4.4.5 Checking the Harmonic Distortion

Button T1 is pressed, connect the frequency counter to jack 1 in G5010 and effect a lock-in of f1 at 45,000 000 MHz. Connect the level meter to jack 2 in G5010.

Measure the harmonic distortion at f = 90 MHz

$$a_{k2} \geqq -26 \text{ dB}.$$

Carry out the same measurement at jack 1.

2.5.5 Fault Elimination on f1-Lock-in Indication G5012 and f1 buffer stage

2.5.5.1 Measuring Instrument Required

1 RF-Multizet meter
1 /uA-Multizet meter
1 Level meter 100 MHz

2.5.5.2 Input Current

Measure the input current with a /uA-Multizet meter.

At pin a5 I = 40 mA ± 5 mA

At pin a8 I = 42 mA ± 5 mA (button T1 is pressed and lamp Lp2 lights)

2.5.5.3 DC operating points

If the input current is too high or too low or if a fault is encountered during the followings checks, check the following currents and voltage with the µA-Multizet meter

$I_{\text{buffer amplifier 1}} = 16 \pm 2$ mA

$I_{\text{lock-in indication +buffer amplifier 2}} = 24 \pm 2$ mA

Test point	V (V) E	V (V) B	V (V) C	uA-Multizet meter meter range
Ts1,Ts4	13 ± 0.5	13.7 ± o.5	10.7 ± 1	30 V
Ts2,Ts3	13.6 ± 0.5	14.3 ± 0.5	10.8 ± 1	30 V
Ts5			10.2 ± 1	10 V
Ts6			9 ± 0.5	10 V
Ts7	lamp SL2 lights/ lamp SL2 fails to light (T1 down)		6/0	10 V
Ts8			3/24	30 V

2.5.5.4 Checking the f1 buffer stage

Connect the level meter to Bu 1. Set the frequency scale f1 to 0 MHz (T1 released)

The output level should amount to

-9 dB ± 1 dB.

Set the frequency scale f1 to 25 MHz and check the frequency response of the buffer amplifier.

The output level should amount to

-14 dB ± 1 dB.

Alignment with R22 and C20 is possible, if required. If the value cannot be achieved, check the input voltage at Bu 9 with the RF Multizet meter.

V = 260 to 300 mV

2.5.7 Fault Elimination on the fo2-oscillator G5014

2.5.7.1 Measuring Instruments Required

1 oscilloscope, e.g. Siemens Oszillar M214 with probe divider 10:1,
1 level meter D335, 1 frequency counter, 1 RF-Multizet meter,
1 µA-Multizet meter, 1 75-Ω termination.

2.5.7.2 Note:

The oscillator G5014 operates with compensation of the temperature coefficient. Never change the setting of the temperature-compensating trimmer C9 in the oscillator. Should a frequency- determining component of the oscillator have to be replaced for the purpose of fault elimination, a new alignment of the resulting temperature coefficient will be required and the film scale must be checked.
For resetting the film scale, see Notes on Maintenance, section 1.2.2.

2.5.7.2.1 Removing the fo2-Oscillator

Remove the film drive knobs. For this purpose, use the hexagonal socket spanner (1.5 DIN 911) included in the spare parts bag. Remove the lamp caps. Unscrew the front shield.Remove the fastening screws from the bottom and the front plate of the oscillator and connect it via short cables. Unscrew the shielding plates. Removal of the shielding plate of the oscillator section will result in a shift of the oscillator frquency.to be taken into consideration during fault location.
fosc = 1 MHz corresponds to 0 kHz on the film scale f2
fosc = 0.9 MHz corresponds to 100 kHz on the film scale f2

2.5.7.3 Oscillator G5015

2.5.7.3.1 Input Current

Measure the input current with a µA-Multizet meter (100-mA range)

At pin a4	I = 80 mA ± 8 mA
At pin b4	I = 8 mA ± 3 mA (button T2 is released)

Fault location and dc operating points:
If the measured value is above or below the specified value or if faults occur during the following check, the dc voltages mentioned below must be measured against chassis ground with a µA-Multizet meter:

Measuring point	6	Ts2-C18	12	Ts5-R28
V (V)	14.6±0.5	5.6±0.3	22.5±0.5	14.6±0.5

2.5.7.3.2 Checking the Varactor Diodes Gr1 and Gr2 and measuring the output voltage

Connect the frequency counter to jack 1 (output). Button T2 is released. It must be possible to change the frequency by 380 Hz, ≤ 660 Hz with R37 and by > 1.7 kHz, 1.9 kHz with potentiometer P1. (stop-stop). Terminate jack 1 (output) into 75 Ω and measure the output voltage as a function of the frequency with the RF Multizet meter. Throughout the frequency range, i.e. from one stop of the drive to the other, the voltage may vary by approx. 10 % referred to the left-hand stop. Alignmend is carried out with L2. If the dependence of the output voltage is excessive, make the following limiter check.

Limiter check:
Set the oscillator to 900 kHz.
Open the link test point 8-9 (G5015)
Connect the oscilloscope to test point 8. An unlimited sine of V_{p-p} = 7 to 8 V must appear. If required, align with R8(G5C15).
Solder link 8-9 (with limitation)
The voltage must be:

2.5.7.3.3 Measuring the Harmonic Distortion

Set the oscillator to 900 kHz and measure the harmonic distortion at jack 1 (at 75 Ω)

f = 1.8 MHz a_{k2} > 30 dB
f = 2.7 MHz a_{k3} > 35 dB

Aligning possibility with C 31.

Checking the RF voltages (at 950 kHz) for the purpose of fault location:
When measured with the oscilloscope, the following voltages must be present at the measuring points:

Measuring point	6	8	12	15
V_{pp} (V)	1.8±0.2	2.8 ±0.2	9.0±0.5	0.8± 0.1

2.5.7.4 Regulating Section G5016

2.5.7.4.1 Input Current

Measure the input current with a µA-Multizet meter (300-mA range).
At pin a5 I = 50 mA ± 7 mA

2.5.7.4.2 Checking the Pulse Shaper (button T2 is pressed)

Connect the oscilloscope to measuring point 3 by means of the 10:1-probe.
Negative 1-kHz pulses with V_{pp} = 15 V ± 1 V must be present at measuring point 3.

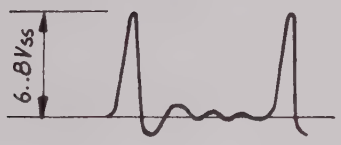
Measuring point 3

2.5.7.4.3 Checking the Pulse Mixer (button T2 is pressed)

Connect the oscilloscope to measuring point 6 by means of the 10:1-probe. Here, 1-kHz pulses of V_{pp} = 6 to 8 V followed

by a damped wave train must be present. Effect alignment with R16.

Measuring point 6



2.5.7.4.4 Checking the Indication Circuit (button T2 released)

Set the oscilloscope to f = 950,700 Hz (measure at jack 1 with a frequency counter). Lamp Lp3 must extinguish and 300 Hz must appear on the instrument "Hz-indication".
Simultaneously, square-wave pulses of V_{pp} = 10 V ± 1 V must be present at measuring point 11 (oscilloscope with probe).

Measuring point 11

Now reduce the frequency to f = 950,030 Hz. The instrument "Hz-indication" must show 970 Hz. Negative spikes of 30 Hz must be present at measuring point 12.

(V_{pp} = 20 V ± 2 V).

Measuring point 12

2.5.7.4.5 Measuring the Regulation Voltage (button T2 released)

Set the oscillator to f = 950,100 kHz. The voltage measured at point 4 of the regulating section G5016 with an oscilloscope must be V_{pp} = 4 V ± 0.25 V. This value can be set with R35 in the oscillator G5015. A clean-cut sine wave must appear.
Connect the µA-Multizet meter (10-V range) + to pin 6b and - to 5b in the oscillator G5015.
The voltage must be 4.8 V ± 0.1 V. Effect alignment with R16 in G5016.

2.5.7.4.6 Setting and Checking the Instrument Indication

(button T2 released)

Set the oscillator to 950,400 Hz ± 1 kHz. 600 Hz must appear on the instrument. Before doing that check the mechanical zero point of the instrument with the device deenergized, if required readjust the zero point. Effect alignment with R50 and R53, respectively.

Now set the oscillator according to the following table:

f (kHz)	Scale indication	Notes
950,000	0 Hz	Lamp lights up
950,004 or 949,996	0 Hz	Lamp flashes at the 4-Hz rate, instrument indicates zero.
950,500	500 Hz	Pointer is swinging back and forth, lamp may light up at the rate of this hunting action.
951,000	0 Hz	Lamp lights up.

2.5.7.4.7 Measuring the Varactor Voltage (button T2 is released)

Connect the µA-Multizet meter to the wiper (central terminal of R37. U = 4.8 V Effect alignment with R37.

Set the oszillator to 0 kHz, lamp Lp3 must light up. Press button T2, the lamp Lp3 must also light, the oscillator must be locked in.

Fine alignment with R16 in G5016.

2.5.8 Fault Elimination on f3-oscillator G5017

Note: When varying the setting of a frequency-determining component in the oscillator and setting the discriminator, respectively, a new alignment of the resulting temperature coefficient of the subassembly becomes necessary.

Before carring out the measurements, the subassembly must have been at least 30 minutes in operation (Thermal equilibrium) For the following checks the oscillator G5018 must be shielded with a cover.

2.5.8.1 Measuring Instruments Required

1 100 MHz Level sender e.g. W2072
1 frequency counter (to 50 MHz)
1 µA-Multizet meter
1 RF-Multizet meter
1 digital voltmeter
1 oscilloscope with calibrated probe (10:1)

2.5.8.2 Input Current of the Subassembly G 5018

Measure the input current at pin a5 with a µA-Multizet meter:
I = 64 mA ± 5 mA.

Fault location:

Measuring point	19	21	Ts3, emitter	Ts3, collector (enclosure)
V (V)	15±1.0	5.5±0.5	8.0±0.8	22.6±0.5

Measuring point	22 R38/C31	14	10	11
V (V)	22.5 ± 0.5	19.3±1	7.4±0.7	6.7±0.5

2.5.8.3 Output voltage and frequency

f2 = 50 kHz locked in.
Oscillator subassembly G5018 with a shielding plate screwed on.
At jack 1 V = 274 mV ± 15 mV (alignment with R 10)
f = 42.55 MHz ± 1×10^{-6} (locked-in oscillator)
Connect test point 5 of G5019 to chassis ground via a short cable.
f = 42.550 kHz ± 10 kHz (free-running oscillator)

If required, re align with G19.
Cancel the ground connection of test point 5.
If the output level has been changed by more than 10 % with R10 or the oscillator frequency (free-running) has been changed, the items 2.5.8.8. to 2.5.8.10 must be checked.

2.5.8.4 Modulator Voltage

Connect the RF-Multizet meter to measuring point 10 (2-V range).
The voltage must be V=1.8V ± 0.2V. The output level at test point 4 should amount to -20 dB ± 2 dB. (f = 0.9 MHz to 1.0 MHz).

2.5.8.5 Input Current of Subassembly G5019

Measure the input current at pin a5 with a µA-Multizet meter.
I = 90 mA...100 mA

2.5.8.6 DC Voltage

Measure the voltage at measuring point 13 (positive pole) against chassis ground

$$V = 9.4\ V \pm 0.4\ V$$

Connect digital voltmeter to measuring point 14 (positive pole) and 12 (negative pole).
The voltage must be 7 V ± 0.1 V.

Fault location:
In the case of incorrect input current or for the purpose of locating faults that have been determined during the RF check, the following dc voltages must be measured against chassis ground.

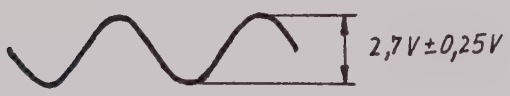
Measuring point	15	Ts2,collec. casing	Ts3,collec. casing	Ts4,collec. casing
V (V)	12.8±1	14.5 ± 1.0	21.4 ± 0.5	21.5 ± 0.5

Measuring point	17	19	JC5-C37	+C38
V (V)	22.5±0.5	10.0±0.5	9.0±1	8.5±0.8

2.5.8.7 Checking the Amplifiers

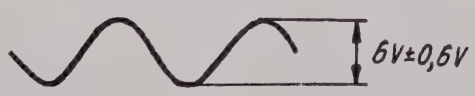
f2-oscillator is locked in at 50 kHz.
Connect the oscilloscope (X = 0.5 µs/cm, Y = 0.2 V/cm) to measuring point 17 by means of the probe divider 10:1. The following trace must now appear:

Subsequently, connect the oscilloscope (with probe) to pin 4 of Ü2 (Y = 0.05 V/cm); the following trace must now appear:



If the above-mentioned measuring values are not reached, connect the oscilloscope to test point 19 with the calibrated probe 10:1.
Oscilloscope setting: X = 0.2 µs/cm; Y = 0.2 V/cm
The following pattern must be displayed:

Connect the oscilloscope (X = 0.5 µs/cm, Y = 0.2 V/cm) with probe to measuring point 20.
The following diagram must appear:



2.5.8.8 Aligning the Discriminator

Connect positive pole of the digital voltmeter (floating) to measuring point 7 and the negative pole to measuring point 9.
f2-oscillator is locked in at 50 kHz.

V = + 5 mV to + 10 mV (without shielding cover)
V = 0 mV (with shielding cover)
If required, align with C47. If readjustment was necessary, check point 2.5.8.10.
Digital voltmeter: Apply positive voltage to test point 8 and negative voltage to test point 9. Tune f2 frequency from -10 kHz to + 115 kHz. The voltage must vary between $V_{115\ kHz}$= -140 mV ± 30 mV and $V_{-10\ kHz}$= +120 mV ± 30 mV.

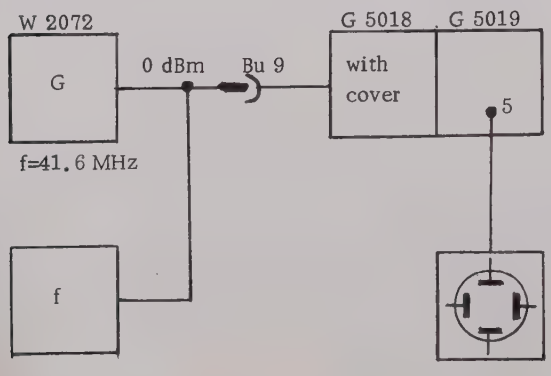
2.5.8.9 Checking the Discriminator

f2-oscillator is locked in at 50 kHz.
Close the oscillator subassembly G5018 with the subassembly cover hermetically.
Connect a floating digital voltmeter between measuring point 5 (positive pole) of G5019 and chassis ground (negative pole).
Withdraw the U-connector J-K from the frequency generator.
Measure the voltage V1. (Guiding values 0 mV to approx. ± 30 mV)
Reinsert U-connector J-K (oscillator is locked in)
Measure the voltage V2 also.
$V_2 = V_1 \pm 10$ mV.
Effect alignment with C19 in G5018.
Tune the f2-oscillator from -10 to +115 kHz.
The voltage displayed on the digital voltmeter may fluctuate by a maximum of ± 50 mV.
If a readjustment was necessary, check point 2.5.8.10.

2.5.8.10 Checking the holding and locking-in range

The G5018 subassembly is firmly closed with the subassembly cover.

Test setup



Oscilloscope with probe

Connect the oscilloscope with probe to M5 (G5019).
(max. sensitivity).
Feed 0 dBm into Bu 9 (G5018) with signal generator W2072.
Starting from 41.6 MHz, slowly reduce the frequency of W2072 until the oscillator locks out. (ac voltage on the oscilloscope).
The frequency displayed on the frequency generator must be:

$f_{uH} \leqq 41.385$ MHz (lower holding range limit)

Slowly increase the frequency again until the oscillator locks in (the ac voltage on the oscilloscope disappears).
The frequency displayed on the counter must be:

$f_{uH} \leqq 41.500$ MHz (lower lock-in range limit)

Repeat the measurement in the same manner as for the frequency $\geqq 41.6$ MHz. The result must be:

$f_{oH} \geqq 41.815$ MHz (upper holding range limit)

$f_{oH} \geqq 41.70$ MHz (upper lock-in range limit)

Set the f2 oscillator to the left-hand stop. Successively pull and insert connector J-K of the frequency generator G2021.
Pull connector W2072 - Bu9 (G5018) and reinsert it and turn G2021 off and on. In all three cases the oscillator must lock in again, i.e. no ac voltage should be displayed on the oscilloscope.
Carry out the same check with the right-hand stop of f_2.

2.5.9 Fault Elimination on the f4-oscillator G5020

2.5.9.1 Measuring Instruments Required

1 oscilloscope, e.g. Siemens M214 with probe divider 10:1
1 digital voltmeter
1 frequency counter of approx. 100 MHz
1 RF-Multizet meter
1 /uA-Multizet meter

2.5.9.2 Input Current of the Subassembly G5021

Measure the input current with a /uA-Multizet meter (100-mA range):

At pin a5 I = 62...78 mA

2.5.9.3 Fault Location and DC Operating Points

If the measured value is above or below the specified value, the following dc voltages (voltage at the emitter) must be measured against chassis ground with a µA-Multizet meter:

Measuring point	Ts1-R5	15	12	(voltage at the emitter) Ts9-R64	Ts10-R67
V(V)	2±0.2	6.7±0.5	5.8±0.5	5.2±0.5	13.2±0.5

Measuring point	Ts11-R69
V(V)	12.4 ± 0.5

2.5.9.4 Input Current of Subassembly G5022

Measure the input current at pin a5 with a µA-Multizet meter (100-mA range): I = 55 mA ± 7 mA (button T4 released)
I = 52 mA ± 7 mA (button T4 pressed)

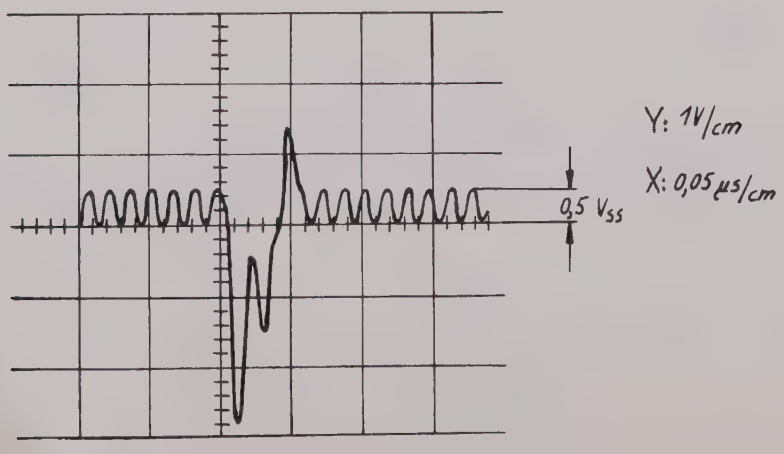
2.5.9.5 Fault Location and DC Operating Points

If the measured value is above or below the specified value, the following dc voltages (voltage at the emitter) must be measured against chassis ground with a µA-Multizet meter:

Measuring point	Ts1-R10	Ts3-C19	Ts4-R43	Ts5-R61
V(V)	2.7±0.5	2±0.2	3.5±0.5	9.2±0.5

2.5.9.6 Checking the Pulse Shaper in G5022

Connect the oscilloscope with probe divider 10:1 to R15-Gr4. The following pulse shape must result:



2.5.9.7 Checking the Regulating Voltage in G5022

Measure the dc voltage at pin 12 with the digital voltmeter.
V = 3.7 V ± 30 mV (link of point 1 is unsoldered). Effect alignment with R23.
If required, align additionally with R36 (≥ 12 k Ω)

2.5.9.8 Checking the Output Stage in G5022

Connect the oscilloscope to R57-Ü1/6.
V_{pp} = 700 mV ± 40 mV. The waveform must be sinusoidal.

If the value is not reached, connect the RF Multizet meter to test point 1 (G5022).
V = 230 mV ± 30 mV
Align with R7 (G5022)
Reduce or increase the value of R7 if the voltage is too high or too low.

2.5.9.9 Checking the Output Level in G5021

Measure the ac voltage with the RF-Multizet meter:

At pin 6 V = 274 mV ± 10 %

When the subassembly is operating satisfactorily, the frequency at the jacks 1 and 2 is

$$f = 41.6 \text{ MHz} \pm 1 \times 10^{-6}$$

If the nominal value is not reached (oscillator is out of lock) first effect alignment 2.5.9.7 and then effect lock-in of the oscillator with R47 in G5021.

2.5.10 Fault Elimination on the 500-Hz Low-pass Filter G5023

2.5.10.1 Measuring Instruments Required

1 µA-Multizet meter
1 oscilloscope

2.5.10.2 Input Current

Measure the input current at pin 8 with a µA-Multizet meter:
I=3 mA, ± 0.5 mA

2.5.10.3 Checking the DC Voltage

Voltage is measured with the oscillator out of lock (T2 is released) and fo2 = 950 kHz ± 3 Hz.

At pin 1/2	V = +4.8 V ± 5 %
At pin 12/13	V = +4.8 V ± 5 %

2.5.10.4 Checking the AC Voltage

Voltage is measured with the oscillator out of lock (T2 is released) and fo2 = 950,480 kHz ± 3 Hz.

At pin 6 V = 0.2 V_{pp} to 0.3 V_{pp}

2.5.11 Fault Elimination on Power Supply D5024

2.5.11.1 Measuring Instruments Required

1 tube voltmeter U122
1 AC-Multizet meter
1 /uA-Multizet meter
1 digital voltmeter

2.5.11.2 Open-circuit Current

The open-circuit current of the subassembly must be measured with the ac Multizet meter (60-mA range) at a mains voltage of 220 V.

$$I_{max} \leqq 30 \text{ mA}$$

2.5.11.3 Setting the Output Voltages Under the Equipment Load

Connect the digital voltmeter to pins 6 and 10 of the strip "b". Output voltage V = 24 V ± 50 mV
Align with potentiometer R24
At a line voltage of ± 10 % the output voltage should remain constant.

Fault location:

If the input current is too high or the output voltage cannot be set, check the following dc voltages (at 220-V line voltage below the equipment load)

Measuring against chassis ground (point 10 on the circuit board)

Measuring point	3	5	7	8	Emitter Ts5	Emitter Ts8
V (V)	31±1	30±1	25.5±0.6	24.5±0.2	14±1,5	14.6±1.5

Measuring point against measuring point

Measuring point	6 - 8	4 - 10
V (V)	4.8 ± 0.6	37 ± 1.5

Measurement at component parts

Component part	Gr8 and Gr9	Gr10	C4
V (V)	13.6±1	6.2±0.5	20±2

2.5.11.4 AC Voltage Measurement

The following ac voltages must be measured with the ac Multizet meter:

Measuring point Strip a	4-5	4-6	13-20
V (V)	approx.9	approx.11	approx.220

2.5.11.5 Checking the Hum Voltage

U122 to the measuring range 10 mV.

Hum voltage at pin b10/12 against chassis ground

$$\leq 1 \text{ mV}$$

Carry out the same check at a mains voltage of ± 10 %.

If the hum voltage is too high the Zener diodes Gr8, 9 may be the source of the fault.

from inside and bend over. As the initial tension of the film rollers is lost when replacing the transport band, the film must also be inserted again in accordance with the instructions.

Taking Down the Film

1. Either the film cassette is accessible from the front of the unit or the unscrewing of only a partial front name plate or front name plate is required.
2. Turn film drive, if possible, as far as the left-hand stop (beginning of scale), failing this, roll the film by hand on to the left-hand roller after taking down the film cassette. (point 4).
3. Slacken fixing screws (A) of the film guide and pull out the film guide towards the front (Fig. 1).
4. Wind film completely on to roller C and detach adhesive strip from roller D (Fig. 3).
5. Unwind film from roller C and detach adhesive strip from roller C.Carefully remove any residue of adhesive from the rollers.

Inserting the New Film

The spare film must be rolled in such a manner that the lettering for the high frequencies is legible from the outside. Remove dust particles from the film guide with a soft brush, the proceed as follows:

6. Grasp roller C, turn sprocket roller E four turns counter-clockwise (the equalizing spring in roller C is tensioned during the process) and lock in this position by tightening the set screw F with an hexagon socket spanner 1.5 DIN 911, Fig. 4.
7. Stick adhesive strip (40 mm x 19 mm), e.g. "Tesafilm" adhesive strip, order No. 5859, Messrs. Beiersdorf, Hamburg, on to the legible end of the film in such a manner that 20 mm are left projecting (Fig. 2).

8. Stick end of film on to roller C (Fig. 2). The edge of the film must be parallel with the edge of the roller after glueing.
9. Roll film tightly on to roller C (Fig. 3) and grip until point 11 has been carried out.
10. Slip end of film (beginning of scale) only as far through the bearing support and stiffening piece until it can be taughtly glued on to the roller D.
11. Stick film on to roller D as described under points 7 and 8 (Fig. 3).
12. Slacken set screw F (Fig. 4). Spring tension must now be felt. If roller C is gripped and sprocket roller E given a quarter turn anticlockwise, the sprocket roller must return to its initial position when being released.
13. Turn one of the sprocket rollers until the first unlettered scale mark coincides exactly with the graduation mark in the scale window. (This mark designates the mechanical stop of the film drive).
14. The film drive must be at the left-hand end stop.
15. Insert film guide carefully without exerting pressure and note whether the film perforations drop into the sprocket.
16. Uniformly tighten the three fixing screws (A) of the film guide.
17. Verify for a second time that the film has been inserted correctly by checking the frequency calibration.

FILM DRIVE, REPLACING THE SCALE FILM

The film drive is of rugged construction and requires no maintenance. The film tape which carries the scale divisions, individually applied by a photographic process, consists of particularly strong and permanent plastic special foil (Dupont Cronar Film No. 225 B 35) for the purpose of ensuring greatest accuracy in setting the frequency. Under normal conditions therefore, trouble need not be anticipated. Should a fault nevertheless occur, take down the film cassette with care, following the instructions given below and detect the fault. Never attempt to move the drive by using force. Should the film have been damaged, then insert the spare film by following these instructions. We recommend that the piece of negative film supplied with the equipment is forwarded to our works for making a new spare film after the removal of the spare film.

If the transport band (Fig. 4) has been torn, order a replacement under the order description of "Transport Band C44106-A7-C109 with 2 clips C44106-A7-C110". When placing the band in position, make sure that the lettering on the inner surface of the band is legible; insert the two clips into the overlapping perforations

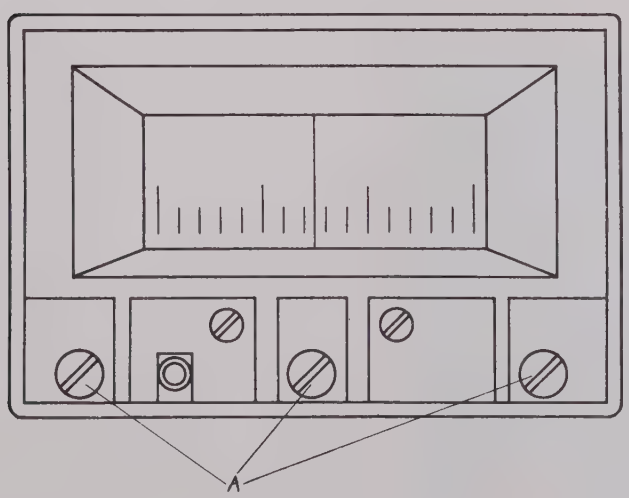


Fig. 1 Film guide

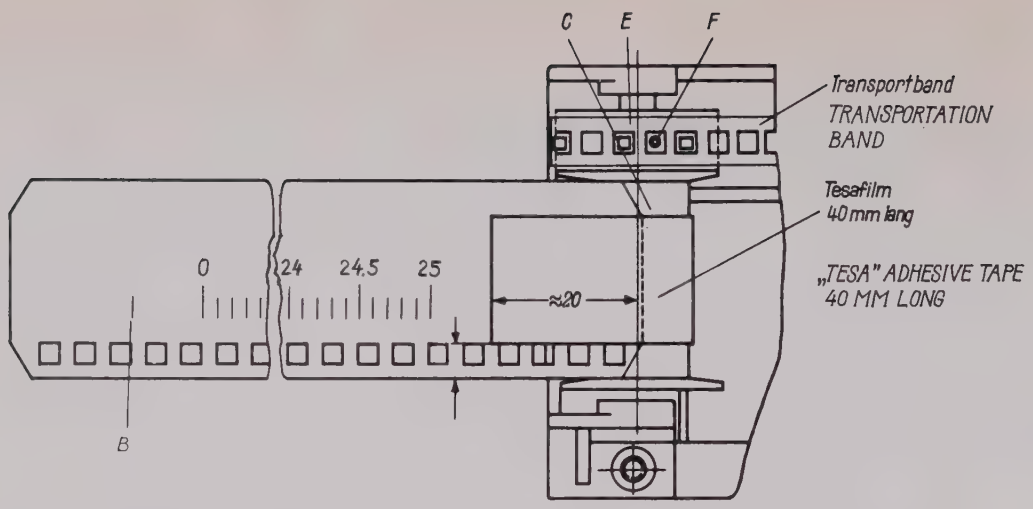


Bild 2 Ankleben des Filmband-Endes
FIG.2 CEMENTING THE END OF THE FILM BAND IN POSITION

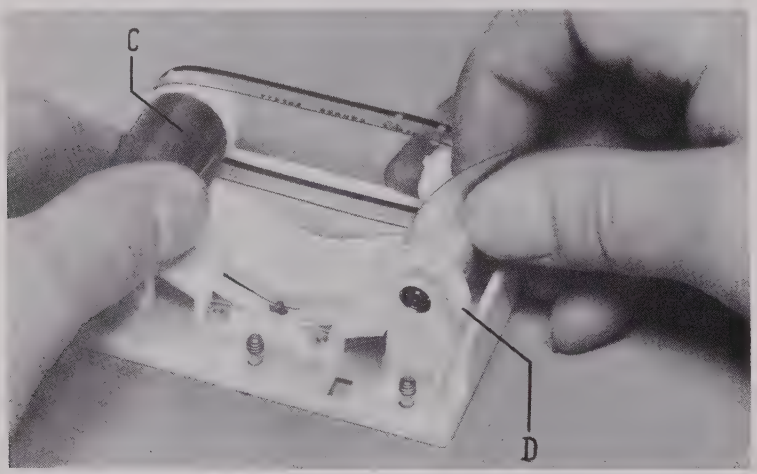


Bild 3 Ankleben des Filmband-Anfangs
FIG.3 CEMENTING THE START OF THE FILM BAND IN POSITION

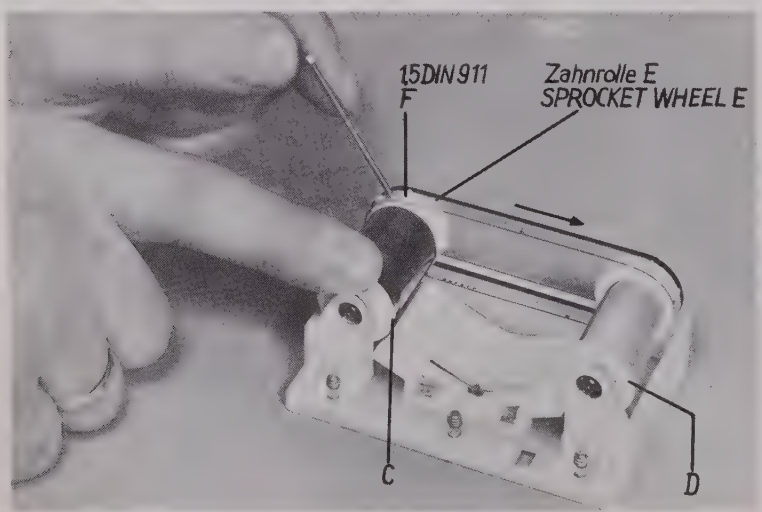


Bild 4 Lösen der Vorspannungs-Arretierung
FIG.4 RELEASING THE DETENT OF THE MECHANICAL BIAS

5. S T Ü C K L I S T E

Vorbemerkung

Unter Symbol stehen die in den Stromläufen verwendeten Abkürzungen für die Bauteile in alphabetischer und - soweit möglich - in numerischer Reihenfolge. Mit Stück ist die Anzahl der gleichen Bauteile innerhalb der Geräte oder der Baugruppe bezeichnet. In der Spalte Gegenstand sind ausser dem Namen des Bauteils auch seine Hauptkennwerte angegeben. Mit der Bestellnummer ist das Bauteil durch einen Abkürzungs-Code oder eine Bauvorschrift eindeutig gekennzeichnet.

Es bedeuten:

bei einem Widerstand: 300 kΩ ±5 %; 0,5 W
- 300 kΩ . . . . . Nennwert des Widerstandes
- ±5 % . . . . . Toleranz des Nennwiderstandes
- 0,5 W . . . . . Belastbarkeit bezogen auf Umgebungstemperatur 20°C

bei einem Kondensator: 1000 pF ±20 %; 125 V-
- 1000 pF . . . . . Nennwert der Kapazität (1 pF = µµF = 10^{-12} F)
- ±20 % . . . . . Toleranz der Nennkapazität
- 125 V- . . . . . zulässige Betriebsgleichspannung

bei einem Übertrager:

Wicklg.I (1a,2a,3a)	Wicklg.II (rtsw,gesw, rtgn,gegnsw)+
440 Wdg 0,1 CuL 75 Ω	
228 µH ±2 %	720 Wdg HFL SS 60x0,03 35Ω
Abgriff(2a): 210 Wdg	1.Abgriff (gesw): 46 Wdg
	2.Abgriff (rtgn): 190 Wdg

Wicklg.I (1a,2a,3a)
- 440 Wdg . . . . . 440 Windungen, Anfang Lötöse 1a, Ende 3a;
- 0,1 CuL . . . . . aus Kupferdraht (Cu); 0,1 mm Ø; lackisoliert (L)
- 75 Ω . . . . . Gleichstromwiderstand der Wicklung I
- 228 µH . . . . . Induktivität
- Abgriff(2a): 210 Wdg . . Abgriff bei der 210.Windung, Lötöse 2a

Wicklg.II sinngemäss wie bei Wicklung I
- HFL SS 60x0,03 . . . . . Hochfrequenzlitze 2fach seidenumsponnen (SS), aus Kupferdraht 60x0,03 mmØ

bei einem Gleichrichter: 50 V/250 mA
- 50 V . . . . . Anschluss-Wechselspannung
- 250 mA . . . . . entnehmbarer Betriebsstrom

+ Farbkurzzeichen
bl = blau ge = gelb gr = grau sw = schwarz rs = rosa
br = braun gn = grün rt = rot ws = weiss rtsw = rot/schwarz

5. PARTS LIST

Introductory remark

The "SYMBOL" column shows the abbreviations used in the circuit diagrams in alphabetic and, to the extent possible, numerical order. "QTY" denotes the number of identical components within the devices or the subassembly. The "DESCRIPTION" column gives, apart from the designation of the components, its principal characteristic data. The "ORDER NUMBER" column designates the component nonambiguously by an abbreviation code or a component specification.

There denotes, for instance

with a resistor:	300 kΩ ±5%; 0,5 W
300 kΩ	Nominal value of the resistance
±5%	Tolerance of the nominal resistance
0,5 W	Wattage rating, as referred to an ambient temperature of 20°C
with a capacitor:	1000 pF ±20%; 125 V-
1000 pF	Nominal value of the capacitance (1 pF = 1 µµF = 10^{-12} F)
±20%	Tolerance of the nominal capacitance
125 V-	Permissible DC operating voltage

with a transformer:

Wicklg. I(1a,2a,3a)	Wicklg. II(rtsw,gesw, rtgn,gegnsw)+
440 Wdg 0,1 CuL 75 Ω	720 Wdg HFL SS 60x0,03 35 Ω
228 µH ±2%	1.Abgriff(gesw): 46 Wdg
Abgriff(2a): 210 Wdg	2.Abgriff(rtgn): 190 Wdg

Wicklg.I(1a,2a,3a)	
440 Wdg	440 turns, start soldering lug 1a, end 3a
0,1 CuL	of copper wire (Cu); 0.1 mm dia., enamelled (L)
75 Ω	DC resistance of winding I
228 µH	Inductance
Abgriff(2a):210Wdg	Tap at soldering lug 2a at the 210th turn
Wicklg. II . . .	Analogously to winding I
HFL SS 60x0,03 .	RF copper Litz wire, with double silk covering, 60x0.03 mm dia.
with a rectifier:	50 V/250 mA
50 V	Primary AC voltage
250 mA	Available operating current

+Color symbols

bl = blue	ge = yellow	gr = gray	sw = black	rs	= pink
br = brown	gn = green	rt = red	ws = white	rtsw	= red/black

FREQENCY GENERATOR 0,01-25MHz S45034-G2021-B712,B714

Ausführung G2021-B712: Beschriftung Dt/En
MODEL G2021-B712: LETTERING GERMAN/ENGLISH
Ausführung G2021-B714: Beschriftung En
MODEL G2021-B714: LETTERING ENGLISH

Symbol SYMBOL	Stück QTY	Gegenstand DESCRIPTION	Bestellangabe ORDERING DATA	Seite PAGE
	1	f_o-Oszillator f_o-OSZILLATOR	S45035-G5001-B711	5-3
	1	Frequenzteiler FREQENCY DIVIDER	S45035-G5002-B711	5-4
	1	Verteilerbaugruppe DISTRIBUTION SUB ASS	S45035-G5003-B711	5-4
	1	f_{o1}-Oszillator f_{o1}-OSZILLATOR	S45035-G5008-B701	5-4
	1	f_1-Rastanzeige und f_1-Trennverstärker f_1-LOCK INDICATION AND f_1-BUFFER AMPLIFIER	S45035-G5012-C711	5-6
	1	f_{o2}-Oszillator f_{o2}-OSZILLATOR	S45035-G5014-B701	5-6
	1	f_3-Oszillator f_3-OSZILLATOR	S45035-G5017-B711	5-8
	1	f_4-Oszillator f_4-OSZILLATOR	S45035-G5020-B711	5-9
	1	500-Hz-Tiefpaß 500-Hz-LOW-PASS FILTER	S45035-G5023-A711	5-10
	1	Netzteil POWER SUPPLY UNIT	S45035-D5024-A722	5-10
		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1,6	2	47 Ohm±5%; 0,33W	B54413-A2470-J	
R 3	1	270 Ohm±5%; 1W	B54513-A271-J	
R 4	1	160 Ohm±5%; 0,33W	B54413-A2161-J	
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR		
P 1	1	50k Ohm±20%;lin;1W	W40954-A8503-M1	
		Elko ELECTROLYTIC CAPACITOR		
C 1	1	47/uF+100-10%;25V	B41283-A5476-Z	
D,E	2	Kammrelais CRADLE RELAY	V23162-A722-B104	
		Diode DIODE		
Gr 1,2	2	BAW 76	Q62702-A397	
S 1	1	Netzschalter POWER SUPPLY SWITCH	C22315-Z1-C8	
	1	Schutzkappe zu S1 SWITCH-CAP TO S1	C44123-A12-C1	
Ts 1,2,4	3	Taste KEY-SWITCH	C44315-Z4-C1	
J	1	Drehspulinstrument MOVING-COIL INSTRUMENT D87x69S/ 40/uA	V70349-A575-A4	
	3	Blende, gn LAMP CAP (GREEN) Fg lp 68d	C30230-A68-A4	
	1	Blende, ws LAMP CAP (WHITE) Fg lp 68a	C30230-A68-A1	
	4	Signallampe SIGNAL LAMP 12V/0,6W/Fg lp 62bf	C30230-Z62-A56	
		Koax Kabel KOAX CABLE		
Le 1	1		V42251-C188-A102	
Le 2	1		V42251-C140-A106	
Le 3	1		V42251-C149-A106	
Le 4	1		V42251-C140-A138	
Le 6	1		V42251-C175-A110	
Le 7	1		V42251-C140-A137	
Le 9	1		V42251-C149-A106	
Le 11	1		V42251-C316-A100	
Bu 3	1	Einbaubuchse KOAX-JACK 1,6/5,6	C42334-A76-A14	
		für Ausführung -B712 FOR MODEL -B712		
	1	Frontschild FRONT-PLATE	S45034-G2021-W22	
		für Ausführung -B714 FOR MODEL -B714		
	1	Frontschild FRONT-PLATE	S45034-G2021-W24	

f_o-OSZILLATOR (1 MHz)

		Drahtwiderstand WIRE RESISTOR		
R 1	1	270 Ohm±5%; 1W	B52260-A9271-J	
		Schichtwiderstand LAYER-TYPE RESISTOR		
R 2	1	470 Ohm±5%; 0,25W	B54412-A2471-J	
R 3	1	1,2k Ohm±5%; 0,35W	B51262-A2122-J	
R 4	1	4,7k Ohm±5%; 0,35W	B51262-A2472-J	
R 5	1	15k Ohm±5%; 0,5W	B51263-A2153-J	
R 6,13,27 28,34	5	56 Ohm±5%; 0,25W	B54412-A2560-J	
R 8	1	4,7k Ohm±5%; 0,35W	B51262-A2472-J	
R 9	1	1k Ohm±5%; 0,33W	B54413-A2102-J	
R 10,15	2	8,2k Ohm±5%; 0,5W	B51371-A4822-J	
R 11,12	2	3,3k Ohm±5%; 0,5W	B51371-A4332-J	
R 16,17	2	820 Ohm±5%; 0,5W	B51371-A4821-J	
R 18,36	2	47 Ohm±5%; 0,25W	B54412-A2470-J	
R 19	1	5,6k Ohm±5%; 0,36W	B51262-A2562-J	
R 22	1	1,2k Ohm±5%; 0,5W	B51371-A4122-J	
R 23	1	12k Ohm±5%; 0,5W	B51263-A2123-J	
R 24,29	2	2,2k Ohm±5%; 0,35W	B51262-A2222-J	
R 25	1	180 Ohm±5%; 0,25W	B54412-A2181-J	
R 26	1	2,7k Ohm±5%; 0,35W	B51262-A2272-J	
R 30	1	22k Ohm±5%; 0,35W	B51262-A2223-J	
R 31	1	820 Ohm±5%; 0,33W	B54413-A2821-J	
R 32	1	1,8k Ohm±5%; 0,35W	B51262-A2182-J	
R 33	1	1,8k Ohm±5%; 0,5W	B51263-A2182-J	
R 37	1	100 Ohm±5%; 0,5W	B54414-A2101-J	
		Übertrager TRANSFORMER		
Ü 1	1		V40622-W3068	
Ü 2	1		V40622-W3069	
		Tantal-Elko TANTAL-CAPACITOR		
C 1	1	15/uF±20%; 20V	B45170-A3156-M	
C 2,3,12 15,17	5	2,2/uF±20%; 20V	B45170-A3225-M	
		Glimmer-Kondensator GLIMMER-CAPACITOR		
C 4	1	820pF±5%; 500V	W40015-C5821-J5	
		Keramik-Kondensator CERAMIC CAPACITOR		
C 5	1	68pF±2%;N150; 500V	B38222-J5680-G	
		Tantal-Elko TANTAL-CAPACITOR		
C 6	1	2,2/uF±20%; 20V	B45170-A3225-M	
		Glimmer-Kondensator GLIMMER-CAPACITOR		
C 8	1	75pF±2%; 500V	W40015-B5750-G5	
		Kf-Kondensator Kf-CAPACITOR		
C 10	1	1800pF±10%; 160V	B31861-A1182-K	
		Tantal-Elko TANTAL-CAPACITOR		
C 11,23	2	1/uF±20%; 35V	B45170-A4105-M	
		Keramik-Kondensator CERAMIC CAPACITOR		
C 16,18, 19	3	1500pF+30-20%;500V	B37638-B5152-R1	
		Tantal-Elko TANTAL-CAPACITOR		
C 22	1	6,8/uF±20%; 35V	B45170-A4685-M	
		Trimmer TRIMMER		
C 9	1	0,8...30pF	B39405-A1300-X	
A	1	SG-GM-Relais DRY-READ-RELAY	V42280-E29-A5	
		Zenerdiode ZENER DIODE		
Gr 1	1	U_z=12V	V42292-Z3-A15	
Gr 2	1	U_z=8,2V	V42292-Z4-A15	
		Diode DIODE		
Gr 3..5 8..10	6	BAW 76	Q62702-A397	
		Transistor TRANSISTOR		
Ts 1..4	4	2N 706 A	Q62702-S16	
Ts 5	1	2N 3053	Q62702-L15	
		Quarz mit Thermostat CRYSTAL WITH THERMOSTAT		
	1	f=1MHz	Q92721-A1000-H	

Frequenzteiler S45035-G5002-B711-1

FREQENCY DIVIDER

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1	1	3k Ohm±5%;	0,35W	B51262-A2302-J
R 2,6	2	5,1k Ohm±5%;	0,35W	B51262-A2512-J
R 3,12,28	3	3,3k Ohm±5%;	0,35W	B51262-A2332-J
R 4,13 34,39	4	22 Ohm±5%;	0,25W	B54412-A2220-J
R 5	1	300 Ohm±5%;	0,25W	B54412-A2301-J
R 7	1	5,6 Ohm±5%;	0,25W	B54413-A2050-J6QC
R 8,15,22	3	75 Ohm±5%;	0,33W	B54413-A2750-J
R 9	1	2,7k Ohm±5%;	0,35W	B51262-A2272-J
R 10,27, 29	3	1k Ohm±5%;	0,35W	B51262-A2102-J
R 11,24	2	5k Ohm±5%;	0,35W	B51262-A2502-J
R 14	1	150 Ohm±5%;	0,25W	B54412-A2151-J
R 20,21	2	300 Ohm±5%;	0,33W	B54413-A2301-J
R 23,26	2	6,8k Ohm±5%;	0,35W	B51262-A2682-J
R 25	1	330 Ohm±5%;	0,5W	B54414-A2331-J
R 30,31	2	270 Ohm±5%;	0,25W	B54412-A2271-J
R 32,36	2	680 Ohm±5%;	0,35W	B51262-A2681-J
R 33	1	100 Ohm±5%;	0,25W	B54412-A2101-J
R 35	1	470 Ohm±5%;	0,35W	B51262-A2471-J
R 37	1	500 Ohm±5%;	0,35W	B51262-A2501-J
R 38	1	160 Ohm±5%;	0,25W	B54412-A2161-J
R 40	1	390 Ohm±5%;	0,35W	B51262-A2391-J
		Elko ELECTROLYTIC CAPACITOR		
C 1	1	470 uF+50-10%;	16V	B41588-A4477-T
		MKM-Kondensator MKM-CAPACITOR		
C 2	1	0,01 uF±20%;	160V	B32435-A2103-M
		Tantal-Elko TANTAL-CAPACITOR		
C 3,6	2	33 uF±20%;	10V	B45170-A1336-M
		MKM-Kondensator MKM-CAPACITOR		
C 4	1	0,1 uF±20%;	160V	B32435-A2104-M
		Tantal-Elko TANTAL-CAPACITOR		
C 5	1	1 uF±20%;	35V	B45170-A4105-M
C 7,13	2	47 uF±20%;	35V	B45170-A4476-M
C 8	1	100 uF±20%;	10V	B45170-A1107-M
C 9	1	22 uF±20%;	35V	B45170-A4226-M
C 10	1	68 uF±20%;	10V	B45170-A1686-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 11,12	2	1000pF+30-20%;	500V	B37638-B5102-R1
		Transistor TRANSISTOR		
Ts 1	1	2 N 2218		Q62702-S2
Ts 2..7	6	BCY 58 VIII		Q60203-Y58-H
		Integr.Schaltkreis INTEGR CIRCUIT		
IC 1,2,3	3	S N 7490 N		Q67000-J10
		Diode DIODE		
Gr 1	1	BAW 76		Q62702-A397
		Gleichrichter RECTIFIER		
Gr 2	1	1000mA/40V		C66067-A1707-A2
		Zenerdiode ZENER DIODE		
Gr 3	1	U_z=7,5V		Q62702-Z573

Verteilerbaugruppe S45035-G5003-B711-1

DISTRIBUTION SUB ASSEMBLY

	2	f_{o1}/f_3-Verteiler f_{o1}/f_3-DISTRIBUTER		S45035-G5006-A721
	1	100-kHz-Verteiler 100-kHz-DISTRIBUTER		S45035-G5007-A721
		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1	1	47 Ohm±5%;	0,33W	B54413-A2470-J
TP 1	1	Dufi LOW-PASS FILTER		V42257-F2-A1
		Duko LEAD-THROUGH CAPACITOR		
C 7,8	2	3200pF+50-20%;	250V	B37411-B2322-S
	2	Einbaustecker DC-PLUG		C42334-A69-A21
	1	Massestecker GROUND-PLUG		C42334-A69-A10
	2	Einbaubuchse KOAX-JACK 1,6/5,6		C42334-A76-A14
	2	Gerätebuchse KOAX-JACK 1,6/5,6		C42334-A80-A18

f_{o1}/f_3-Verteiler S45035-G5006-A721-1

f_{o1}/f_3-DISTRIBUTER

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1,23	2	300 Ohm±2%;	0,33W	B54413-A2301-G
R 2,24	2	68 Ohm±5%;	0,33W	B54413-A2680-J
R 3	1	1,5k Ohm±5%;	0,5W	B51263-A2152-J
R 4,17	2	560 Ohm±5%;	0,33W	B54413-A2561-J
R 5,10,18	3	56 Ohm±5%;	0,33W	B54413-A2560-J
R 6,27	2	1,5k Ohm±5%;	0,5W	B51263-A2152-J
R 8	1	150 Ohm±5%;	0,25W	B54412-A2151-J
R 9,22	2	2,7k Ohm±5%;	0,35W	B51262-A2272-J
R 11	1	4,3k Ohm±5%;	0,35W	B51262-A2432-J
R 12	1	10k Ohm±5%;	0,35W	B51262-A2103-J
R 15	1	56 Ohm±5%;	0,25W	B54412-A2560-J
R 16	1	75 Ohm±5%;	0,33W	B54413-A2750-J
R 25	1	1,5k Ohm±5%;	0,35W	B51262-A2152-J
Ü 1,2	2	Übertrager TRANSFORMER		V45237-L3011
L 1	1	Luftspule AIR COIL		V40623-F3032
		Keramik-Kondenssator CERAMIC CAPACITOR		
C 1..3 5,10,11	6	1500pF+30-20%;	500V	B37638-B5152-R
C 4,9	2	4700pF+30-20%;	500V	B37632-B5472-R1
		Transistor TRANSISTOR		
Ts 1..4	4	2 N 918		Q62702-F35
	2	Einbaubuchse KOAX-JACK		C42334-A76-A4

100-kHz-Verteiler S45035-G5007-A721-1

100-kHz-DISTRIBUTER

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1	1	220 Ohm±2%;	0,25W	B54412-A2221-G
R 2	1	400 Ohm±5%;	0,25W	B54412-A2401-J
R 3,4	2	20 Ohm±2%;	0,25W	B54412-A2200-G
		Tantal-Elko TANTAL-CAPACITOR		
C 1	1	6,8 uF±20%;	35V	B45170-J4685-M
		Transistor TRANSISTOR		
Ts 1	1	2 N 2218 A		Q62702-S29

f_{o1}-Oszillator S45035-G5008-B701-2

f_{o1}-OSZILLATOR

1	Oszillator OSZILLATOR		S45035-G5009-A711
1	Verstärker AMPLIFIER		S45035-G5010-A711
1	Regelteil REGULATING SECTION		S45035-G5011-A711
1	Filmskalenantrieb FILM-SCALE DRIVE		C44106-A7-A4
1	Drehknopf mit Kurbel TUNING KNOB WITH HANDLE		C44106-A20-A5
1	Drehknopf TUNING KNOB		C44106-A20-A3

Oszillator S45035-G5009-A711-4

OSZILLATOR

	1	Oszillator-Platte OSZILLATOR PLATE		S45035-G5009-S1
		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1	1	12 Ohm±5%;	0,25W	B54412-A2120-J
R 2	1	150 Ohm±5%;	0,33W	B54413-A2151-J
R 3	1	560 Ohm±5%;	0,5W	B51263-A2561-J
R 4,5	2	22 Ohm±5%;	0,25W	B54412-A2220-J
R 8	1	180k Ohm±5%;	0,5W	B51263-A2184-J
R 9	1	22k Ohm±5%;	0,5W	B51263-A2223-J
L 1	1	Spule COIL		C40623-M3068
		Keramik Spule CERAMIC COIL		
L 2	1	160nH/4851716		C42330-Z8-C6

		Keramik-Kondensator CERAMIC CAPACITOR		
C 1,2,9	3	1600pF+30-20%;	350V	B37470-B3162-R
C 3	1	15pF±5%;	NO75; 50V	B38471-J150-J
C 4	1	56pF±1%;	NO75; 50V	B38471-J560-F
C 5	1	100pF±1%;	NO75; 50V	B38451-J101-F
C 8	1	4,7pF±0,25pF;	500V	B38211-J5040-C703
C 10	1	150pF±1%;	NO75; 50V	B38451-J151-F1
C 12	1	2,5pF±0,25pF;	500V	B38212-J5020-C503
C 11	1	Drehkondensator VAR CAPACITOR 10/80pF		V45246-Z3013-A1
C 15	1	Trimmer TRIMMER		C40208-Z131-A3
		Thermotrimmer THERMO TRIMMER		
C 16	1	2,5pF; ±1000.10^{-6}/°C		V45246-Z3001
		Diode DIODE		
Gr 1	1	ITT 700		Q62702-A281
		Varaktordiode VARIO CAP		
Gr 2	1	1 N 5144 A		Q62702-X17

Oszillator-Platte S45035-G5009-S1-4
OSZILLATOR PLATE

		Transistor TRANSISTOR		
Ts 1	1	2 N 918		Q62702-F35

Verstärker S45035-G5010-A711-3
AMPLIFIER

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1	1	8,2k Ohm±5%;	0,5W	B51263-A2822-J
R 2	1	4,7k Ohm±5%;	0,5W	B51263-A2472-J
R 3	1	3,9k Ohm±5%;	0,5W	B51263-A2392-J
R 5	1	180 Ohm±5%;	0,5W	B51263-A2181-J
R 8	1	1,5k Ohm±5%;	0,5W	B51263-A2152-J
R 9	1	39k Ohm±5%;	0,5W	B51263-A2393-J
R 11	1	12k Ohm±5%;	0,5W	B51263-A2123-J
R 12	1	10k Ohm±5%;	0,5W	B51263-A2103-J
R 15,18,19	3	56 Ohm±5%;	0,33W	B54413-A2560-J
R 16	1	150 Ohm±5%;	0,5W	B51263-A2151-J
R 17	1	270 Ohm±5%;	0,5W	B51263-A2271-J
R 22	1	2,2k Ohm±5%;	0,5W	B51263-A2222-J
R 23,26	2	300 Ohm±2%;	0,33W	B54413-A2301-G
R 24,29	2	100 Ohm±5%;	0,5W	B51263-A2101-J
R 25,30	2	680 Ohm±5%;	0,33W	B54413-A2681-J
R 32	1	5,6k Ohm±5%;	0,5W	B51263-A2562-J
R 33	1	120 Ohm±5%;	0,5W	B51263-A2121-J
R 36	1	1k Ohm±5%;	0,5W	B51263-A2102-J
R 37	1	47 Ohm±5%;	0,33W	B54413-A2470-J
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR		
R 4	1	4,7k Ohm±20%;	1W	V44215-Z3008-B9
		Drahtpotentiometer WIRE-TYPE VAR RESISTOR		
R 31	1	1k Ohm±10%;	0,5W	W40108-A8102-K8
Ü 1,2	2	Übertrager TRANSFORMER		V45237-L3011
		Tantal-Elko TANTAL CAPACITOR		
C 1	1	3,3/uF±20%;	15V	B45170-J2335-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 2,3,9	3	4700pF+30-20%;	500V	B37632-B5472-R1
C 5,10,11 12,15	5	1500pF+30-20%;	500V	B37638-B5152-R
		Duko LEAD-THROUGH CAPACITOR		
C 23	1	3000pF+50-20%;	100V	C42334-A69-A1
		Diode DIODE		
Gr 1	1	BAW 76		Q62702-A397
		Zenerdiode ZENER DIODE		
Gr 2,3,4	3	U_z=6,8V		V42292-Z4-A13
		Transistor TRANSISTOR		
Ts 1,2,3	3	2 N 918		Q62702-F35
Ts 4	1	2 N 2218 A		Q62702-S29
	1	Einbaustecker DC-PLUG		C42334-A69-A21
	2	Gerätebuchse KOAX-JACK 1,6/5,6		C42334-A80-A8

Regelteil S45035-G5011-A711-6
RECULaTING SECTION

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1	1	180 Ohm±5%;	0,33W	B54413-A2181-J
R 2	1	15 Ohm±5%;	0,25W	B54412-A2150-J
R 3,53	2	10k Ohm±5%;	0,35W	B51262-A2103-J
R 4,30	2	3,9k Ohm±5%;	0,5W	B51263-A2392-J
R 5	1	18 Ohm±5%;	0,25W	B54412-A2180-J
R 6	1	120 Ohm±5%;	0,33W	B54413-A2121-J
R 8	1	100 Ohm±5%;	0,25W	B54412-A2101-J
R 9	1	560 Ohm±5%;	1W	B54513-A561-J
R 10,57	2	82 Ohm±5%;	0,5W	B51263-A2820-J
R 11,38 47	3	10k Ohm±5%;	0,5W	B51263-A2103-J
R 12	1	8,2k Ohm±5%;	0,5W	B51263-A2822-J
R 15	1	470 Ohm±5%;	0,5W	B54414-A2471-J
R 17	1	470k Ohm±5%;	0,6W	B51372-A4474-J
R 18,22, 23	3	4,7k Ohm±5%;	0,5W	B51263-A2472-J
R 19,45	2	470k Ohm±5%;	0,5W	B51263-A2474-J
R 24	1	1,5k Ohm±5%;	0,5W	B51263-A2152-J
R 25	1	5,6k Ohm±5%;	0,5W	B51262-A2562-J
R 26	1	39k Ohm±5%;	0,5W	B51263-A2393-J
R 29	1	180 Ohm±5%;	0,25W	B54412-A2181-J
R 31,62	2	56 Ohm±5%;	0,25W	B54412-A2560-J
R 32,44 58	3	470 Ohm±5%;	0,33W	B54413-A2471-J
R 37	1	33k Ohm±5%;	0,5W	B51262-A2333-J
R 39	1	220 Ohm±5%;	0,25W	B54412-A2221-J
R 40	1	2,2k Ohm±5%;	0,5W	B51263-A2222-J
R 43	1	33 Ohm±5%;	0,25W	B54412-A2330-J
R 46	1	56k Ohm±5%;	0,5W	B51263-A2563-J
R 50	1	10k Ohm±5%;	0,5W	B51263-A2103-J
R 52	1	750 Ohm±5%;	0,33W	B54413-A2751-J
R 54	1	2,7k Ohm±5%;	0,35W	B51262-A2272-J
R 59,60	2	68k Ohm±5%;	0,5W	B51263-A2683-J
R 61	1	6,8k Ohm±5%;	0,5W	B51263-A2682-J
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR		
R 23,51	2	1k Ohm±20%;	lin; 1W	V44215-Z3009-B7
Ü 1	1	Übertrager TRANSFORMER		V40622-W3079
		Spule COIL		
L 1	1			V40622-W3080
L 2	1			V40622-W3081
		Keramik-Kondensator CERAMIC CAPACITOR		
C 1	1	4700pF+30-20%;	500V	B37632-B5472-R1
C 3	1	6800pF+30-20%;	500V	B37636-B5682-R1
		Tantal-Elko TANTAL CAPACITOR		
C 4,17, 25,29	4	6,8/uF±20%;	35V	B45170-A4685-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 5	1	150pF±20%;	500V	B37615-B5151-M1
C 8	1	5600pF+30-20%;	500V	B37643-B5562-R
C 10	1	300pF±5%;	N750; 500V	B38226-J5301-J
C 11	1	220pF±20%;	500V	B37618-B5221-M1
C 15	1	1500pF±20%;	500V	B37623-B5152-M
C 16,18	2	1800pF+30-20%;	500V	B37643-B5182-R
		MKH-KOndensator MKH-CAPACITOR		
C 19	1	0,01/uF±20%;	250V	B32220-K3103-M
C 22,31	2	0,015/uF±20%;	250V	B32220-K3153-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 23	1	22pF±5%;	N750; 500V	B38216-J5220-J
		Tantal-Elko TANTAL CAPACITOR		
C 24	1	0,47/uF±20%;	35V	B45170-A4474-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 30,32 33	3	2700pF+30-20%;	500V	B37632-B5272-R1
		Tantal-Elko TANTAL CAPACITOR		
C 36	1	22/uF±20%;	6V	B45170-A226-M
		Kf-Kondensator Kf-CAPACITOR		
C 37	1	432pF±2%;	160V	B31861-A1431-G200
C 38	1	400pF±2%;	160V	B31861-A1401-G
C 39	1	350pF±2%;	160V	B31861-A1351-G
C 40	1	50pF±1pF;	160V	B31861-A1500-F
C 43	1	175pF±2%;	160V	B31861-A1171-G500

		Keramik-Kondensator CERAMIC CAPACITOR	
C 44	1	4700pF+30-20%;500V	B37648-B5472-R1
C 45	1	1000pF+30-20%;500V	B37638-B5102-R
		Diode DIODE	
Gr 1,2,4	3	ITT 700	Q62702-A281-F4
Gr 5,8,9, 10	4	BAW 76	Q62702-A397
		Transistor TRANSISTOR	
Ts 1..5	5	2 N 2218 A	Q62702-S29
		Thernewid THERNEWID THERMISTOR	
R 36	1	100k Ohm±10%	Q63011-K104-K
		SG-GM-Relais DRY-READ-RELAY	
A	1	C42303-A7-A2	V42280-E29-A5
	6	Einbaustecker DC-PLUG	C42334-A69-A21
	1	Massestecker GROUND-PLUG	C42334-A69-A10
	1	Gerätebuchse KOAX-JACK 1,6/5,6	C42334-A80-A8

f_1-Rastanzeige u.f_1-Trennverst. S45035-G5012-C711-1

f_1-LOCK INDICATION AND f_1-BUFFER AMPLIFIER

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1	1	75 Ohm±5%;	0,33W	B54413-A2750-J
R 2,21	2	2,4k Ohm±5%;	0,5W	B51263-A2242-J
R 3,6,7, 15,17, 20,54	7	56 Ohm±5%;	0,33W	B54413-A2560-J
R 4,19,37 46,58	5	5,6k Ohm±5%;	0,5W	B51263-A2562-J
R 5,18	2	1,5k Ohm±5%;	0,5W	B51263-A2152-J
R 8,16	2	300 Ohm±5%;	0,33W	B54413-A2301-J
R 9,12	2	180 Ohm±5%;	0,33W	B54413-A2181-J
R 10,11	2	2,7k Ohm±5%;	0,5W	B51263-A2272-J
R 22	1	68 Ohm±5%;	0,25W	B54412-A2680-J
R 32,43	2	220 Ohm±5%;	0,33W	B54413-A2221-J
R 33	1	68k Ohm±5%;	0,5W	B51263-A2683-J
R 36	1	10k Ohm±5%;	0,5W	B51263-A2103-J
R 38	1	820 Ohm±5%;	0,5W	B51263-A2821-J
R 39	1	68 Ohm±5%;	0,33W	B54413-A2680-J
R 40,47	2	330 Ohm±5%;	0,33W	B54413-A2331-J
R 44	1	39k Ohm±5%;	0,5W	B51263-A2393-J
R 45	1	15k Ohm±5%;	0,5W	B51263-A2153-J
R 50	1	1,8k Ohm±5%;	0,5W	B51263-A2182-J
R 51	1	100k Ohm±5%;	0,5W	B51263-A2104-J
R 52	1	1k Ohm±5%;	0,5W	B51263-A2102-J
R 53	1	12k Ohm±5%;	0,5W	B51263-A2123-J
R 57	1	1,8k Ohm±5%;	0,5W	B51263-A2182-J
Ü 1,2	2	Übertrager TRANSFORMER		V45237-L3011
		UKW-Drossel VHF REACTOR		
L 2	1	160 µH;0,3A		B82501-A-A28
L 4	1	6 µH;2A		B82501-A-A14
		Keramik-Kondensator CERAMIC CAPACITOR		
C 1,6	2	560pF+30-20%;	500V	B37635-B5561-R
C 2..5, 10,26	6	4700pF+30-20%;500V		B37632-B5472-R1
C 11	1	1500pF+30-20%;500V		B37638-B5152-R1
		Elko ELECTROLYTIC CAPACITOR		
C 15,17	2	22 µF+50-10%;	40V	B41588-A7226-T
		MKL-Kondensator MKL-CAPACITOR		
C 16,18	2	1,5 µF±20%;	25V	B32110-C3155-M
		Tantal-Elko TANTAL CAPACITOR		
C 19,23	2	47 µF±20%;	6V	B45170-A476-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 20	1	33pF±5%;N075;	500V	B38211-J5330-J1
		Elko ELECTROLYTIC CAPACITOR		
C 24	1	10 µF+50-10%;	40V	B41588-A7106-T
		Tantal-Elko TANTAL CAPACITOR		
C 25	1	6,8 µF±20%;	10V	B45170-A1685-M
		Diode DIODE		
Gr 1,2	2	BAW 76		Q62702-A397
		Transistor TRANSISTOR		
Ts 1..4	4	2 N 918		Q62702-F35
Ts 5,6	2	2 N 706 A		Q62702-S16
Ts 7,8	2	2 N 2218 A		Q62702-S29
	4	Einbaustecker DC-PLUG		C42334-A69-A21
6 a	1	Massestecker GROUND-PLUG		C42334-A69-A10
	2	Gerätebuchse KOAX-JACK 1,6/5,6		C42334-A76-A14

f_{o2}-Oszillator S45035-G5014-B701-2

f_{o2}-OSZILLATOR

	1	Oszillator OSZILLATOR	S45035-G5015-A711
	1	Regelteil und Anzeigekreis REGULATING SECTION AND INDICATING CIRCUIT	S45035-G5016-A711
		Dreh-Kondensator VAR CAPACITOR	
C 4	1	8/72pF	V45246-Z3007-A1
	1	Filmskalenantrieb FILM-SCALE DRIVE	C44106-A7-A4
	1	Drehknopf mit Kurbel TUNING KNOB WITH HANDLE	C44106-A20-A5
	1	Drehknopf TUNING KNOB	C44106-A20-A3

Oszillator S45035-G5015-A711-4

OSZILLATOR

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1,2, 6,7	4	27k Ohm±5%;	0,5W	B51263-A2273-J
R 3,15,28 30,34	5	1k Ohm±5%;	0,33W	B54413-A2102-J
R 4,9	2	12k Ohm±5%;	0,5W	B51263-A2123-J
R 5	1	560 Ohm±5%;	0,5W	B51263-A2561-J
R 8,38	2	8,2k Ohm±5%;	0,5W	B51263-A2822-J
R 10,26 35	3	10k Ohm±5%;	0,5W	B51263-A2103-J
R 11,17 23,39	4	4,7k Ohm±5%;	0,5W	B51263-A2472-J
R 12	1	1,2k Ohm±5%;	0,5W	B51263-A2122-J
R 16	1	330 Ohm±5%;	0,33W	B54413-A2331-J
R 18	1	100 Ohm±5%;	0,33W	B54413-A2101-J
R 19	1	39k Ohm±5%;	0,5W	B51263-A2393-J
R 20,24	2	10 Ohm±5%;	0,33W	B54413-A2100-J
R 21	1	3,9k Ohm±5%;	0,5W	B51263-A2392-J
R 25	1	820 Ohm±5%;	0,33W	B54413-A2821-J
R 27	1	100 Ohm±5%;	0,25W	B54412-A2101-J
R 29	1	33k Ohm±5%;	0,5W	B51263-A2333-J
R 31	1	120 Ohm±5%;	0,33W	B54413-A2121-J
R 32	1	470 Ohm±5%;	0,5W	B54512-A471-J
R 33	1	220 Ohm±5%;	0,33W	B54413-A2221-J
R 36	1	16k Ohm±5%;	0,5W	B51263-A2163-J
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR		
R 22	1	4,7k Ohm±20%;	1W	V44215-Z3009-B9
R 37	1	5k Ohm±20%;	0,6W	W40957-A8502-M1
Ü 1	1	Übertrager TRANSFORMER		V40622-X3001
		Spule COIL		
L 1	1			V45230-K3003
L 2	1			V40622-W3060
		UKW-Drossel VHF REACTOR		
L 3	1	3 µH;3A		B82501-A-A13
		Keramik-Kondensator CERAMIC CAPACITOR		
C 1,16,22 23,29	5	1000pF+30-20%;500V		B37638-B5102-R
C 2	1	8,2pF±0,5pF;N075;500V		B38212-J5080-D200
		Glimmer-Kondensator GLIMMER CAPACITOR		
C 5	1	120pF±1%;	350V	B34350-A3121-F
		Keramik-Kondensator CERAMIC CAPACITOR		
C 6	1	4700pF+30-20%;500V		B37632-B5472-R1
C 7	1	6pF±0,5pF;N075;500V		B38212-J5060-D
C 8	1	33pF±1%;N330;	500V	B38224-J5330-F

		Glimmer-Kondensator GLIMMER CAPACITOR		
C 10	1	8200pF±1%;	250V	W40016-B2822-F
		MKM-Kondensator MKM-CAPACITOR		
C 11,32	2	0,1/uF±10%;	160V	B32435-A2104-K
		Glimmer-Kondensator GLIMMER CAPACITOR		
C 12	1	4700pF±1%;	250V	W40016-B2472-F
		Keramik-Kondensator CERAMIC CAPACITOR		
C 13	1	6pF±0,5pF;NP0;	500V	B38212-A5060-D
		Tantal-Elko TANTAL CAPACITOR		
C 15,24	2	1/uF±20%;	35V	B45170-A4105-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 17	1	1500pF+30-20%;	500V	B37638-B5152-R
C 18	1	4700pF+30-20%;	500V	B37632-B5472-R1
		Tantal-Elko TANTAL CAPACITOR		
C 19	1	2,2/uF±20%;	10V	B45170-A1225-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 25	1	33pF±5%;N150;	500V	B38222-J5330-J
		MKM-Kondensator MKM-CAPACITOR		
C 30,34	2	0,047/uF±10%;	160V	B32435-A2473-K
		Kf-Kondensator Kf-CAPACITOR		
C 31	1	1200pF±5%;	160V	B31861-A1122-J
		Tantal-Elko TANTAL CAPACITOR		
C 33,36	2	6,8/uF±20%;	35V	B45170-A4685-M
		MKL-Kondensator MKL-CAPACITOR		
C 35	1	0,1/uF±20%;	100V	B32110-D104-M
		Trimmer TRIMMER		
C 3	1	0,8...8,5pF		B39405-A1080-X500
		Thermotrimmer THERMO TRIMMER		
C 9	1	2,5pF±1000.10^{-6}/°C		V45246-Z3001
B	1	SG-GM-Relais DRY READ RELAY		V42280-E29-A5
		Varaktor-Diode VARIO CAP		
Gr 1,2	2	1 N 5148 A		Q62702-X18
		Diode DIODE		
Gr 3,4	2	BAW 76		Q62702-A397
		Zenerdiode ZENER DIODE		
Gr 6	1	U_z=5,1V		V42292-Z4-A10
Gr 7	1	U_z=15V		V42292-Z4-A21
		Transistor TRANSISTOR		
Ts 1..5	5	2 N 2218 A		Q62702-S29
	8	Einbaustecker DC-PLUG		C42334-A69-A21
	1	Gerätebuchse KOAX-JACK 1,6/5,6		C42334-A80-A8

Regelteil und Anzeigekreis S45035-G5016-A711-5
REGULATING SECTION AND INDICATING CIRCUIT

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1,25	2	1,2k Ohm±5%;	0,5W	B51263-A2122-J
R 2	1	22 Ohm±5%;	0,33W	B54413-A2220-J
R 3	1	18k Ohm±5%;	0,5W	B51263-A2183-J
R 4	1	12k Ohm±5%;	0,5W	B51263-A2123-J
R 5	1	680 Ohm±5%;	0,33W	B54413-A2681-J
R 6	1	1k Ohm±5%;	0,35W	B51262-A2102-J
R 8	1	330 Ohm±5%;	0,33W	B54413-A2331-J
R 9,12, 15,54	4	10k Ohm±5%;	0,35W	B51262-A2103-J
R 10	1	7,5k Ohm±5%;	0,5W	B51263-A2752-J
R 11,19, 23,57	4	100 Ohm±5%;	0,33W	B54413-A2101-J
R 13	1	100 Ohm±5%;	0,25W	B54412-A2101-J
R 17	1	68k Ohm±5%;	0,5W	B51263-A2683-J
R 18	1	6,8k Ohm±5%;	0,5W	B51263-A2682-J
R 22	1	150 Ohm±5%;	0,33W	B54413-A2151-J
R 24	1	100k Ohm±5%;	0,35W	B51262-A2104-J
R 29	1	2,2k Ohm±5%;	0,5W	B51263-A2222-J
R 30	1	56k Ohm±5%;	0,5W	B51263-A2563-J
R 31	1	8,2k Ohm±5%;	0,5W	B51263-A2822-J
R 32	1	560 Ohm±5%;	0,25W	B54412-A2561-J
R 33	1	390k Ohm±5%;	0,5W	B51263-A2394-J
R 36	1	22k Ohm±5%;	0,35W	B51262-A2223-J
R 37	1	15k Ohm±5%;	0,5W	B51263-A2153-J
R 38	1	27k Ohm±5%;	0,5W	B51263-A2273-J
R 39,51	2	1,5k Ohm±5%;	0,5W	B51263-A2152-J
R 40	1	18k Ohm±5%;	0,35W	B51262-A2183-J
R 43,52	2	22k Ohm±5%;	0,5W	B51263-A2223-J
R 44	1	4,7k Ohm±5%;	0,5W	B51263-A2472-J
R 45	1	18k Ohm±2%;	0,35W	B51262-A2183-G
R 46	1	82 Ohm±5%;	0,33W	B54413-A2820-J
R 47	1	47k Ohm±5%;	0,35W	B51262-A2473-J
R 53	1	3,9k Ohm±5%;	0,35W	B51262-A2392-J
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR		
R 16	1	220 Ohm±20%;	1W	V44215-Z3009-B5
R 50	1	1k Ohm±20%;	0,6W	W40957-A8102-M1
Ü 1	1	Übertrager TRANSFORMER		V40622-W3061
		Spule COIL		
L 1	1			V40622-W3062
L 2	1			V40622-P3445
L 3	1			V40622-P3446
		UKW-Drossel VHF REACTOR		
L 4	1	40/uH;0,2A		B82501-A-C7
		MKM-Kondensator MKM-CAPACITOR		
C 1,10,17 19,33	5	0,1/uF±10%;	160V	B32435-A2104-K
		Tantal-Elko TANTAL CAPACITOR		
C 2	1	33/uF±20%;	35V	B45170-A4336-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 3,16,18	3	1000pF+30-20%	500V	B37638-B5102-R
		MKH-Kondensator MKH-CAPACITOR		
C 4	1	0,01/uF±10%;	400V	B32235-A6103-K
		Keramik-Kondensator CERAMIC CAPACITOR		
C 5,8	2	1800pF+30-20%;	500V	B37638-B5182-R
		MKH-Kondensator MKH-CAPACITOR		
C 9	1	0,1/uF±10%;	250V	B32235-A3104-K
		Tantal-Elko TANTAL CAPACITOR		
C 11,12, 15,29, 31,32,38	7	6,8/uF±20%;	35V	B45170-A4685-M
		MKL-Kondensator MKL-CAPACITOR		
C 20	1	0,1/uF±20%;	100V	B32110-D104-M
		Kf-Kondensator Kf-CAPACITOR		
C 22	1	19000pF±1%;	100V	B31695-B1193-F
C 23	1	3900pF±1%;	100V	B31693-B1392-F
		MKM-Kondensator MKM-CAPACITOR		
C 24	1	0,22/uF±10%;	160V	B32435-A2224-K
C 25	1	0,12/uF±10%;	160V	B32435-A2124-K
		MKL-Kondensator MKL-CAPACITOR		
C 26	1	2,2/uF±20%;	25V	B32110-C3225-M
C 27	1	0,01/uF±20%;	250V	B32220-K3103-M
		Kf-Kondensator Kf-CAPACITOR		
C 36,37	2	3300pF±5%;	160V	B31362-J1332-J
		Tantal-Elko TANTAL CAPACITOR		
C 39	1	68/uF±10%;	30V	B45265-A5686-K
C 40	1	1/uF±20%;	50V	B45170-A5105-M
		MKM-Kondensator MKM-CAPACITOR		
C 41	1	1/uF±10%;	160V	B32435-B2105-K
		Diode DIODE		
Gr 1..4	4	BAW 76		Q62702-A397
Gr 6	1	BAY 28		Q60201-Y28
		Transistor TRANSISTOR		
Ts 1,2	2	2 N 2218 A		Q62702-S29
Ts 3,4,5 9...13	8	BFY 34		Q60206-Y34

Ts 8	1	BCY 58 VII	60203-Y58-G
	11	Einbaustecker DC-PLUG	C42334-A69-A21

f_3-Oszillator S45035-G5017-B711-3

f_3-OSZILLATOR

	1	Oszillator u.Modulator OSZILLATOR AND MODULATOR	S45035-G5018-B711
	1	Regelteil REGULATING SECTION	S45035-G5019-B711

Oszillator und Modulator S45035-G5018-B711-4

OSZILLATOR AND MODULATOR

		Schichtwiderstand LAYER-TYPE RESISTOR			
R 1	1	3,9k Ohm±5%;	0,5W		B51263-A2392-J
R 2	1	1,8k Ohm±5%;	0,5W		B51263-A2182-J
R 5	1	560 Ohm±5%;	0,5W		B51263-A2561-J
R 6,20	2	1,5k Ohm±5%;	0,5W		B51263-A2152-J
R 7	1	1,6k Ohm±5%;	0,5W		B51263-A2162-J
R 11	1	130 Ohm±5%;	0,25W		B54412-A2131-J
R 15	1	2,7k Ohm±5%;	0,35W		B51262-A2272-J
R 16,45	2	33k Ohm±5%;	0,5W		B51263-A2333-J
R 19	1	4,7k Ohm±5%;	0,5W		B51263-A2472-J
R 21	1	1,2k Ohm±5%;	0,5W		B51263-A2122-J
R 25,40, 55	3	68 Ohm±5%;	0,33W		B54413-A2680-J
R 28,38	2	100 Ohm±5%;	0,33W		B54413-A2101-J
R 29,59	2	18k Ohm±5%;	0,5W		B51263-A2183-J
R 30,46, 76	3	12k Ohm±5%;	0,5W		B51263-A2123-J
R 33,50, 60,75	4	680 Ohm±5%;	0,5W		B51263-A2681-J
R 34,64	2	470 Ohm±5%;	0,33W		B54413-A2471-J
R 51	1	1k Ohm±5%;	0,5W		B51263-A2102-J
R 52	1	220 Ohm±5%;	0,33W		B54413-A2221-J
R 53	1	390 Ohm±5%;	0,5W		B51263-A2391-J
R 58	1	6,8k Ohm±5%;	0,5W		B51263-A2682-J
R 61	1	10 Ohm±5%;	0,33W		B54413-A2100-J
R 66..69	4	100 Ohm±2%;	0,33W		B54413-A2101-G
R 72	1	820 Ohm±5%;	0,5W		B51263-A2821-J
R 77	1	10k Ohm±5%;	0,5W		B51263-A2103-J
R 79	1	56 Ohm±5%;	0,25W		B54412-A2560-J
R 80	1	18 Ohm±5%;	0,33W		B54413-A2180-J
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR			
R 10	1	220 Ohm±20%;	1W		V44215-Z3008-B5
Ü 1,2	2	Übertrager TRANSFORMER			V45237-L3015
L 1	1	Spule COIL			V45235-K3034
		Keramik-Spule CERAMIC COIL			
L 2	1	280 nH			C44330-Z4-C10
		Spule COIL			
L 3	1				V45235-K3032
L 6	1				V45235-F3036
		UKW-Drossel VHF REACTOR			
L 8	1	6 µH;1,5A			B82501-A-A4
		Keramik-Kondensator CERAMIC CAPACITOR			
C 1,2	2	5600pF+30-20%;500V			B37643-B5562-R
C 3	1	470pF±1%;N750;500V			B38226-J5471-F
C 6	1	68pF±2%; N220;50V			B38463-J680-G
C 7	1	120pF±1%;N220;50V			B38463-J121-F
C 8	1	24pF±2%; N470;50V			B38465-J240-G
C 11,20, 24	3	1500pF±20%;	500V		B37623-B5152-M
C 12,30, 35,42, 47,59, 62,63	8	4700pF+30-20%;500V			B37632-B5472-R1
		Kf-Kondensator Kf-CAPACITOR			
C 25	1	680pF±5%;	160V		B31861-A1681-J
		Keramik-Kondensator CERAMIC CAPACITOR			
C 26	1	390pF±2%;N750;500V			B38226-J5391-G
C 36,39, 46	3	330pF±20%;	500V		B37618-B5331-M1
C 37,38	2	39pF±5%;N470; 500V			B38215-J5390-J
C 40	1	4,7pF±0,5%;N150;500V			B38212-J5040-D700
C 43	1	4700pF+30-20%;500V			B37643-B5472-R
C 45	1	18pF±5%;N150; 500V			B38212-J5180-J
C 51	1	3300pF+30-20%;500V			B37632-B5332-R1
C 54	1	6pF±0,5pF;N150;500V			B38212-J5060-D
C 58	1	100pF±20%;	500V		B37615-B5101-M1
C 60	1	150pF±20%;	500V		B37615-B5151-M1
		Duko LEAD-THROUGH CAPACITOR			
C 50	1	3200pF+50-20%;250V			B37410-B2322-S
		Thermo-Trimmer THERMO TRIMMER			
C 15	1	2,5pF;±1000.10^{-6}/°C			V45246-Z3003
		Trimmer TRIMMER			
C 19	1	1,3/5pF			C40208-Z131-A5
C 55	1	1,9/11pF			C40208-Z131-A6
		Varaktor-Diode VARIO-CAP			
Gr 1	1	1 N 5144 A			Q62702-X17
		Diode DIODE			
Gr 3,4, 7..10	6	ITT 700			Q62702-A281
		Transistor TRANSISTOR			
Ts 1,4, 6,9	4	2 N 918			Q62702-F35
Ts 3	1	2 N 2218 A			Q62702-S29
Ts 10	1	2 N 706 A			Q62702-S16
	2	Einbaustecker DC-PLUG			C42334-A69-A21
	2	Gerätebuchse KOAX-JACK 1,6/5,6			C42334-A80-A8

Regelteil S45035-G5019-B711-2

REGULATING SECTION

		Schichtwiderstand LAYER-TYPE RESISTOR			
R 1,54	2	1k Ohm±5%;	0,5W		B51263-A2102-J
R 2,11	2	20k Ohm±5%;	0,5W		B51263-A2203-J
R 3,12, 47,66	4	10k Ohm±5%;	0,5W		B51263-A2103-J
R 4,15, 19,23,33 38,46,57	8	47 Ohm±5%;	0,33W		B54413-A2470-J
R 5,44	2	680 Ohm±5%;	0,5W		B51263-A2681-J
R 8	1	2,2k Ohm±5%;	0,5W		B51263-A2222-J
R 9,26	2	82 Ohm±5%;	0,33W		B54413-A2820-J
R 10,85	2	1,5k Ohm±5%;	0,5W		B51263-A2152-J
R 16	1	3,6k Ohm±5%;	0,5W		B51263-A2362-J
R 17	1	470 Ohm±5%;	0,5W		B51263-A2471-J
R 18	1	3,3k Ohm±5%;	0,5W		B51263-A2332-J
R 22	1	2,7k Ohm±5%;	0,5W		B51263-A2272-J
R 24,36, 53	3	33 Ohm±5%;	0,33W		B54413-A2330-J
R 25,37, 39	3	820 Ohm±5%;	0,5W		B51263-A2821-J
R 29..32	4	200 Ohm±2%;	0,33W		B54413-A2201-G
R 40	1	100 Ohm±5%;	0,33W		B54413-A2101-J
R 43	1	56 Ohm±5%;	0,33W		B54413-A2560-J
R 45	1	150 Ohm±5%;	0,33W		B54413-A2151-J
R 50	1	6,8k Ohm±5%;	0,5W		B51263-A2682-J
R 51,52	2	390 Ohm±5%;	0,5W		B51263-A2391-J
R 58,59	2	22k Ohm±5%;	0,5W		B51263-A2223-J
R 60,65	2	180 Ohm±5%;	0,33W		B54413-A2181-J
R 61	1	4,7k Ohm±5%;	0,5W		B51263-A2472-J
R 64	1	820 Ohm±5%;	0,33W		B54413-A2821-J
R 67,68	2	2,32k Ohm±1%;	0,125W		B54381-A232-F202
R 73,74	2	1k Ohm±2%;	0,5W		B51263-A2102-G
R 75,78	2	100k Ohm±5%;	0,5W		B51263-A2104-J
R 79	1	120k Ohm±5%;	0,5W		B51263-A2124-J
R 80	1	220k Ohm±5%;	0,5W		B51263-A2224-J
R 81	1	36k Ohm±5%;	0,5W		B51263-A2363-J
R 82	1	12k Ohm±5%;	0,5W		B51263-A2123-J
		Übertrager TRANSFORMER			
Ü 1	1				V45231-F3042
Ü 2	1				V45231-F3043
Ü 3	1				V45231-F3044
		Spule COIL			
L 2	1				V45231-F3045
L 3	1				V45231-F3046
L 4	1				V45231-F3047
L 5	1				V45231-F3048
		UKW-Drossel VHF REACTOR			
L 6	1	6 µH;1,5A			B82501-A-A4
		Keramik-Kondensator CERAMIC CAPACITOR			
C 1,5,25, 6 37,50,51	1	1500pF+30-20%;500V			B37638-B5152-R

C 2	1	100pF±2%;NP0;	500V	B38222-A5101-G
		Tantal-Elko TANTAL CAPACITOR		
C 3,4, 9..12,15 23,36,38	10	4,7/uF±20%;	35V	B45170-J4475-M
C 8,33,39, 40,43,44	6	0,1/uF±20%;	35V	B45170-J4104-M
		Kf-Kondensator Kf-CAPACITOR		
C 16	1	453pF±2%;	160V	B31861-A1451-G300
C 17	1	155pF±2%;	160V	B31861-A1151-G500
C 18	1	644pF±2%;	160V	B31861-A1641-G400
		Keramik-Kondensator CERAMIC CAPACITOR		
C 19	1	49pF±2%;N150;	500V	B38222-J5490-G
		Kf-Kondensator Kf-CAPACITOR		
C 22	1	530pF±2%;	160V	B31861-A1531-G
		Keramik-Kondensator CERAMIC CAPACITOR		
C 24	1	1000pF±5%;	100V	B37979-A1102-J3
		Kf-Kondensator Kf-CAPACITOR		
C 26	1	302pF±2%;	160V	B31861-A1301-G200
C 29	1	131pF±2%;	160V	B31861-A1131-G100
C 30	1	595pF±2%;	160V	B31861-A1591-G500
		Keramik-Kondensator CERAMIC CAPACITOR		
C 31	1	39pF±2%;N150;	500V	B38222-J5390-G
		Kf-Kondensator Kf-CAPACITOR		
C 32	1	371pF±2%;	160V	B31861-A1371-G100
		Keramik-Kondensator CERAMIC CAPACITOR		
C 45,46	2	68pF±1%;NP0;	500V	B38222-A5680-F
C 52	1	2700pF+30-20%;	500V	B37632-B5272-R1
		Tantal-Elko TANTAL CAPACITOR		
C 53	1	3,3/uF±20%;	15V	B45170-J2335-M
		MKL-Kondensator MKL-CAPACITOR		
C 54	1	0,22/uF±20%;	63V	B32110-E9224-M
		Trimmer TRIMMER		
C 47	1	1,3/5pF		C40208-Z131-A5
		Diode DIODE		
Gr 1..6	6	DX 6393		Q62702-A110-F7
		Zenerdiode ZENER DIODE		
Gr 7	1	1 N 2166		Q62702-Z619-F6
		Transistor TRANSISTOR		
Ts 1,2	2	2 N 2218 A		Q62702-S29
Ts 3..6	4	BCY 58 VIII		Q60203-Y58-H
		Breitband-Verstärker INTEGRATE CIRCUIT		
JC 1	1	CA 3012		Q67000-A38-F14
	2	Einbaustecker DC-PLUG		C42334-A69-A21
	1	Gerätebuchse KOAX-JACK 1,6/5,6		C42334-A80-A8

f_4-Oszillator S45035-G5020-B711-1

f_4-OSZILLATOR

1	Oszillator OSZILLATOR		S45035-G5021-B711
1	Regelteil REGULATING SECTION		S45035-G5022-A711

Oszillator S45035-G5021-B711-1

OSZILLATOR

	Schichtwiderstand LAYER-TYPE RESISTOR			
R 1,17	2	12k Ohm±5%;	0,35W	B51262-A2123-J
R 2	1	3,9k Ohm±5%;	0,35W	B51262-A2392-J
R 3	1	100 Ohm±5%;	0,33W	B54413-A2101-J
R 4	1	1,2k Ohm±5%;	0,35W	B51262-A2122-J
R 5	1	390 Ohm±5%;	0,25W	B54412-A2391-J
R 6	1	10 Ohm±5%;	0,25W	B54412-A2100-J
R 9	1	2,2k Ohm±5%;	0,5W	B51263-A2222-J
R 10	1	430 Ohm±5%;	0,25W	B54412-A2431-J
R 12	1	15 Ohm±5%;	0,25W	B54412-A2150-J
R 15,38	2	100 Ohm±5%;	0,25W	B54412-A2101-J
R 16,57	2	5,6k Ohm±5%;	0,35W	B51262-A2562-J
R 18,36	2	1k Ohm±5%;	0,33W	B54413-A2102-J
R 19	1	8,2k Ohm±5%;	0,5W	B51263-A2822-J
R 24	1	330 Ohm±2%;	0,5W	B54313-A331-G
R 26	1	1,5k Ohm±5%;	0,5W	B51263-A2152-J
R 32	1	10 Ohm±5%;	0,33W	B54413-A2100-J
R 37	1	15k Ohm±5%;	0,35W	B51262-A2153-J
R 39,43	2	27k Ohm±5%;	0,35W	B51262-A2273-J
R 40	1	3,3k Ohm±5%;	0,5W	B51263-A2332-J
R 44,46	2	27 Ohm±5%;	0,25W	B54412-A2270-J
R 45	1	680 Ohm±5%;	0,35W	B51262-A2681-J
R 48	1	1k Ohm±5%;	0,35W	B51262-A2102-J
R 51	1	470 Ohm±5%;	0,25W	B54412-A2471-J
R 52	1	75 Ohm±5%;	0,25W	B54412-A2750-J
R 53	1	82 Ohm±5%;	0,25W	B54412-A2820-J
R 58	1	2,4k Ohm±5%;	0,5W	B51263-A2242-J
R 59,67, 69	3	56 Ohm±5%;	0,25W	B54412-A2560-J
R 60	1	2,7k Ohm±5%;	0,35W	B51262-A2272-J
R 61	1	56 Ohm±5%;	0,33W	B54413-A2560-J
R 64	1	39 Ohm±5%;	0,25W	B54412-A2390-J
R 65	1	510 Ohm±5%;	0,33W	B54413-A2511-J
R 66,68	2	300 Ohm±5%;	0,25W	B54412-A2301-J
R 70	1	1,5k Ohm±5%;	0,35W	B51262-A2152-J
R 71	1	180 Ohm±5%;	0,33W	B54413-A2181-J
	Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR			
R 8	1	2k Ohm±10%;	0,5W	W40108-A8202-K8
R 47	1	5k Ohm±20%;	0,6W	W40957-A8502-M1
Ü 2,3	2	Übertrager TRANSFORMER		V45237-L3011
	Spule COIL			
L 1	1			V45231-D3002
L 2,3	2			V45235-K3033
	Keramik-Kondensator CERAMIC CAPACITOR			
C 1,8,9, 12,18,19, 29..32 35,36	12	1500pF+3C-20%;	500V	B37638-B5152-R
C 3	1	68pF±5%;N075;	500V	B38221-J5680-J
C 4,5	2	100pF±5%;N075;	500V	B38221-J5101-J
C 6	1	4700pF+30-20%;	500V	B37632-B5472-R1
	MKM-Kondensator MKM-CAPACITOR			
C 10	1	0,1/uF±20%;	160V	B32435-A2104-M
	Tantal-Elko TANTAL CAPACITOR			
C 16	1	22/uF±20%;	35V	B45170-A4226-M
C 20	1	6,8/uF±20%;	35V	B45170-J4685-M
	Keramik-Kondensator CERAMIC CAPACITOR			
C 24,26	2	39pF±5%;N150;	500V	B38222-J5390-J
C 25	1	82pF±5%;N150;	500V	B38222-J5820-J
	Diode DIODE			
Gr 1	1	ITT 700		Q62702-A281
	Zenerdiode ZENER DIODE			
Gr 2,3	2	U_z=6,2V		V42292-Z4-A12
	Varaktordiode VARIO CAP			
Gr 4,5	2	BB 141		Q62702-B27-F4
	Transistor TRANSISTOR			
Ts 1,2	2	2 N 2218 A		Q62702-S29
Ts 3,9, 10,11	4	2 N 918		Q62702-F35
Ts 5	1	BCY 58 VIII		Q60203-Y58-H
	Schwingquarz CRYSTAL			
Kr 1	1	f=41,6MHz		Q84603-A4160-J
	2	Einbaustecker DC-PLUG		C42334-A69-A21
	1	Gerätebuchse KOAX-JACK 1,6/5,6		C42334-A80-A8

Regelteil S45035-G5022-A711-3

REGULATING SECTION

	Schichtwiderstand LAYER-TYPE RESISTOR			
R 1	1	180 Ohm±5%;	0,33W	B54413-A2181-J
R 2,62	2	15 Ohm±5%;	0,25W	B54412-A2150-J
R 3,11	2	10k Ohm±5%;	0,35W	B51262-A2103-J
R 4	1	3,9k Ohm±5%;	0,35W	B51262-A2392-J

R 5	1	18 Ohm±5%;	0,25W	B54412-A2180-J
R 6	1	120 Ohm±5%;	0,33W	B54413-A2121-J
R 7	1	120 Ohm±5%;	0,25W	B54412-A2121-J
R 8	1	100 Ohm±5%;	0,25W	B54412-A2101-J
R 9	1	560 Ohm±5%;	1W	B54513-A561-J
R 10,57	2	82 Ohm±5%;	0,33W	B54413-A2820-J
R 12	1	8,2k Ohm±5%;	0,5W	B51263-A2822-J
R 15	1	470 Ohm±5%;	0,5W	B54414-A2471-J
R 17,19	2	470k Ohm±5%;	0,5W	B51263-A2474-J
R 18,22, 33	3	4,7k Ohm±5%;	0,5W	B51263-A2472-J
R 24	1	1,5k Ohm±5%;	0,5W	B51263-A2152-J
R 25	1	5,6k Ohm±5%;	0,35W	B51262-A2562-J
R 26	1	39k Ohm±5%;	0,5W	B51263-A2393-J
R 29	1	180 Ohm±5%;	0,25W	B54412-A2181-J
R 30	1	3,9k Ohm±5%;	0,5W	B51263-A2392-J
R 31,63	2	56 Ohm±5%;	0,25W	B54412-A2560-J
R 32,44 58	3	470 Ohm±5%;	0,33W	B54413-A2471-J
R 34	1	100 Ohm±5%;	0,33W	B54413-A2101-J
R 36	1	33k Ohm±5%;	0,5W	B51263-A2333-J
R 37	1	33k Ohm±5%;	0,35W	B51262-A2333-J
R 38,47 53,59	4	10k Ohm±5%;	0,5W	B51263-A2103-J
R 39	1	220 Ohm±5%;	0,25W	B54412-A2221-J
R 40	1	2,2k Ohm±5%;	0,5W	B51263-A2222-J
R 43	1	33 Ohm±5%;	0,25W	B54412-A2330-J
R 45	1	47k Ohm±5%;	0,5W	B51263-A2473-J
R 46	1	56k Ohm±5%;	0,5W	B51263-A2563-J
R 60	1	10k Ohm±5%;	0,35W	B51262-A2103-J
R 61	1	1,8k Ohm±5%;	0,5W	B51263-A2182-J
		Thernewid THERNEWID THERMISTOR		
R 35	1	100k Ohm±10%		Q63011-K104-K
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR		
R 23	1	1k Ohm±20%;lin;1W		V44215-Z3008-B7
Ü 1	1	Übertrager TRANSFORMER		V45231-F3002
		Spule COIL		
L 1	1			V45231-F3003
L 2	1			V45231-F3004
		Keramik-Kondensator CERAMIC CAPACITOR		
C 1,32	2	4700pF+30-20%;	500V	B37632-B5472-R1
C 3,27	2	6800pF+30-20%;	500V	B37636-B5682-R1
		Tantal-Elko TANTAL CAPACITOR		
C 4,17 25,29	4	6,8 µF±20%;	35V	B45170-A4685-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 5	1	150pF±20%;	500V	B37615-B5151-M1
C 8	1	5600pF+30-20%;	500V	B37636-B5562-R1
C 10	1	300pF±5%;N750;	500V	B38226-J5301-J
C 11	1	220pF±20%;	500V	B37618-B5221-M1
C 15,24, 26	3	1500pF±20%;	500V	B37623-B5152-M
C 16,18	2	1800pF+30-20%;	500V	B37643-A5182-R
		MKH-Kondensator MKH-CAPACITOR		
C 19	1	0,01 µF±20%;	250V	B32220-K3103-M
C 22,31	2	0,015 µF±20%;	250V	B32220-K3153-M
		Keramik-Kondensator CERAMIC CAPACITOR		
C 23	1	22pF±5%;N750;	500V	B38216-J5220-J
C 30,33	2	2700pF+30-20%;	500V	B37632-B5272-R1
		Kf-Kondensator Kf-CAPACITOR		
C 37	1	432pF±2%;	160V	B31861-A1431-G200
C 38	1	400pF±2%;	160V	B31861-A1401-G
C 39	1	350pF±2%;	160V	B31861-A1351-G
C 40	1	50pF±2%;	160V	B31861-A1500-G
C 43	1	175pF±2%;	160V	B31861-A1171-G500
		Keramik-Kondensator CERAMIC CAPACITOR		
C 44	1	4700pF+30-20%;	500V	B37648-B5472-R1
		Diode DIODE		
Gr 1,2,5, 8,9,10	6	BAW 76		Q62702-A397
Gr 4	1	ITT 700		Q62702-A281
		Transistor TRANSISTOR		
Ts 1..4	4	2 N 2218 A		Q62702-S29
Ts 5	1	2 N 918		Q62702-F35
	5	Einbaustecker DC-PLUG		C42334-A69-A21

500-Hz-Tiefpaß S45035-G5023-A711-2

500-Hz-LOW-PASS FILTER

		Schichtwiderstand LAYER-TYPE RESISTOR		
R 1,5	2	100 Ohm±5%;	0,33W	B54413-A2101-J
R 2	1	3,9k Ohm±5%;	0,5W	B51263-A2392-J
R 3,4	2	100k Ohm±5%;	0,5W	B51263-A2104-J
R 6	1	10k Ohm±5%;	0,5W	B51263-A2103-J
		Spule COIL		
L 2	1			V45230-Q3003
L 3	1			V45230-Q3004
		MKL-Kondensator MKL-CAPACITOR		
C 18	1	0,15 µF±20%;	100V	B32110-D154-M
		MKM-Kondensator MKM-CAPACITOR		
C 19	1	0,1 µF±10%;	160V	B32435-A2104-K
		Tantal-Elko TANTAL CAPACITOR		
C 20	1	1 µF±20%;	15V	B45170-J2105-M
		Kf-Kondensator Kf-CAPACITOR		
C 22	1	19000pF±1%;	160V	B31864-B1193-F
C 23	1	3900pF±1%;	160V	B31863-B1392-F
		MKM-Kondensator MKM-CAPACITOR		
C 24	1	0,22 µF±10%;	160V	B32435-A2224-K
C 25	1	0,12 µF±10%;	160V	B32435-A2124-K
		Transistor TRANSISTOR		
Ts 1	1	BCY 58 VIII		Q60203-Y58-H
	1	13-pol.Stiftleiste PLUG RECEPTACLE (13-P)		C42334-A51-A7

Netzteil S45035-D5024-A722-3

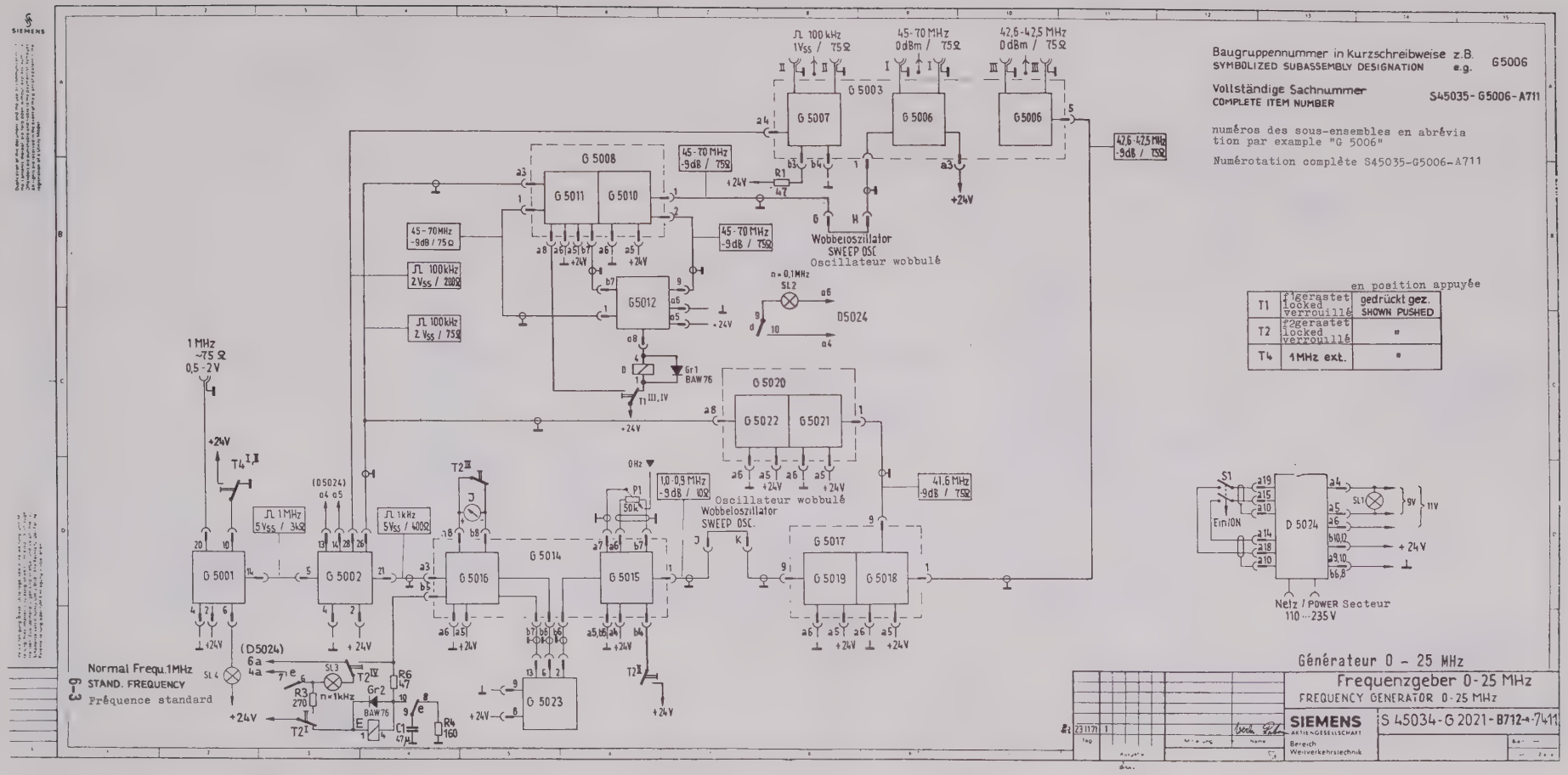
POWER SUPPLY UNIT

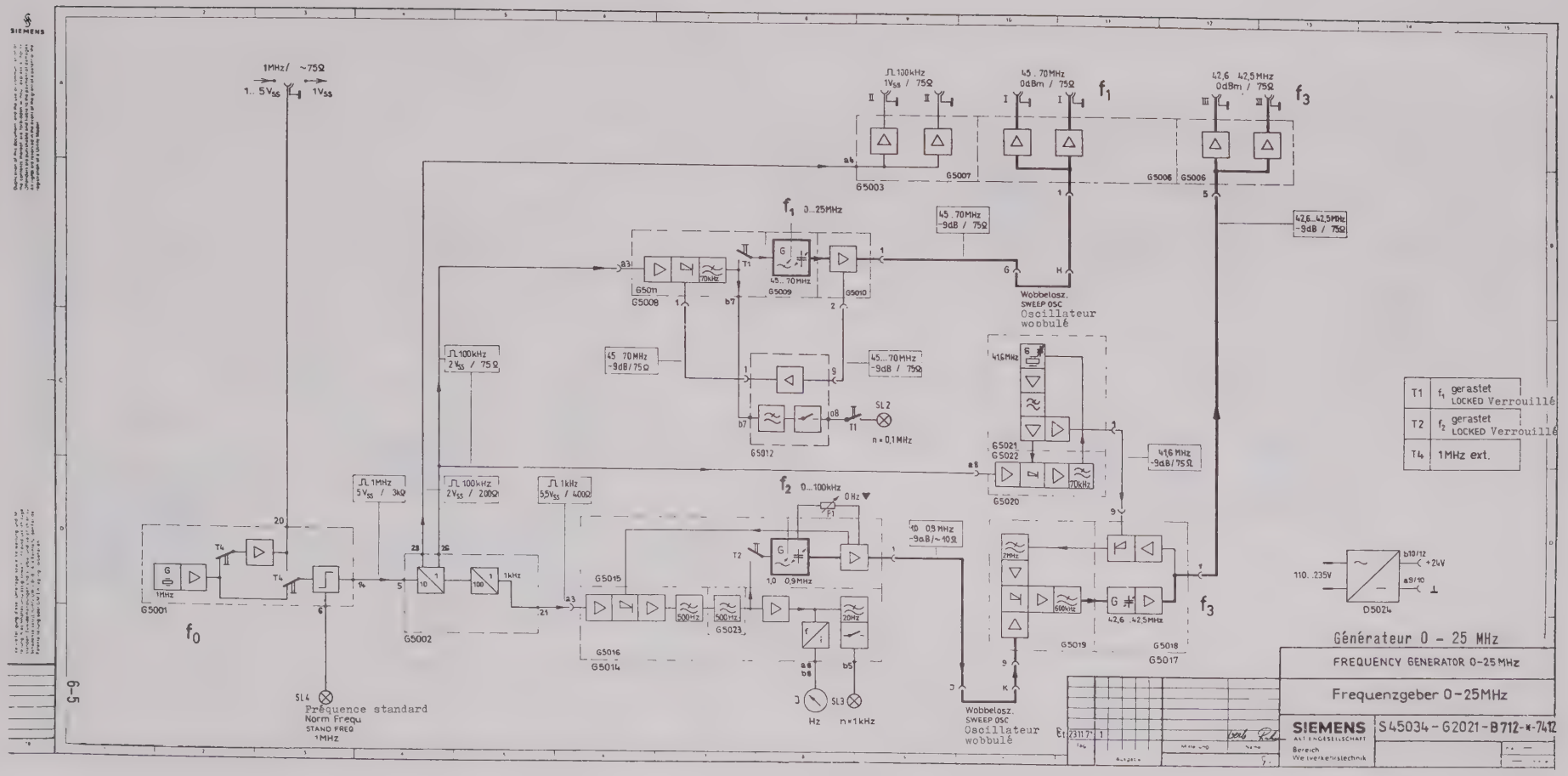
	1	Netzteilplatte POWER SUPPLY BOARD	S45035-D5025-A711
Tr	1	Netztrafo TRANSFORMER	V45221-T3001
		Wicklg.I (1b,3b) 545 Wdg.;0,32 CuL;17 Ohm	
		Wicklg.II (2b,4b) 545 Wdg.;0,32 CuL;17 Ohm	
		Wicklg.III (4b,6b) 40 Wdg.;0,42 CuL;1 Ohm	
		Wicklg.IV (5b,7b) 40 Wdg.;0,42 CuL;1 Ohm	
		Wicklg.VI (1a,2a,3a,) 174 Wdg.;0,65 CuL;1,6 Ohm Abgriff 2a:170Wdg.	
		Wicklg.VII (4a,5a) 96 Wdg.;0,45 CuL;2 Ohm	
		Wicklg.VIII (6d,5d,4d) 52 Wdg.;0,355 CuL;1,8 Ohm Abgriff 5d: 45 Wdg.	
		Wicklg.IX (3d,2d) 90 Wdg.;0,40 CuL;3 Ohm	
		UKW-Drossel VHF REACTOR	
L 1,2	2	30 µH;1A	B82501-A-C35
L 3	1	Spule COIL	V40622-N3616
		Elko ELECTROLYTIC CAPACITOR	
C 1,2,3	3	1000 µF+50-10%;70V	B41711-A8108-T
		Gleichrichter RECTIFIER	
Gr 1	1	40V/3,2A	C66067-A1713-A2
		Transistor TRANSISTOR	
Ts 2,3	2	2 N 3055	Q62702-U8
	1	13-pol.Federleiste JACK STRIP (13-P)	C42334-A52-A1
	1	21-pol.Federleiste JACK STRIP (21-P)	C42334-A54-A1
	1	Gerätestecker POWER PLUG	C42334-Z31-C1
	1	Buchse GROUND-JACK	C42334-F3-C1
	1	Spannungswähler VOLTAGE ADJUSTER	C44315-Z6-C2
	1	Sicherungshalter FUSE-SOCKET	C42327-Z13-C1
	1	Schraubkappe FUSE-CAP	C42327-Z12-C2
	1	Schmelzeinsatz FUSE M 0,4 C	D41571-M400-C2

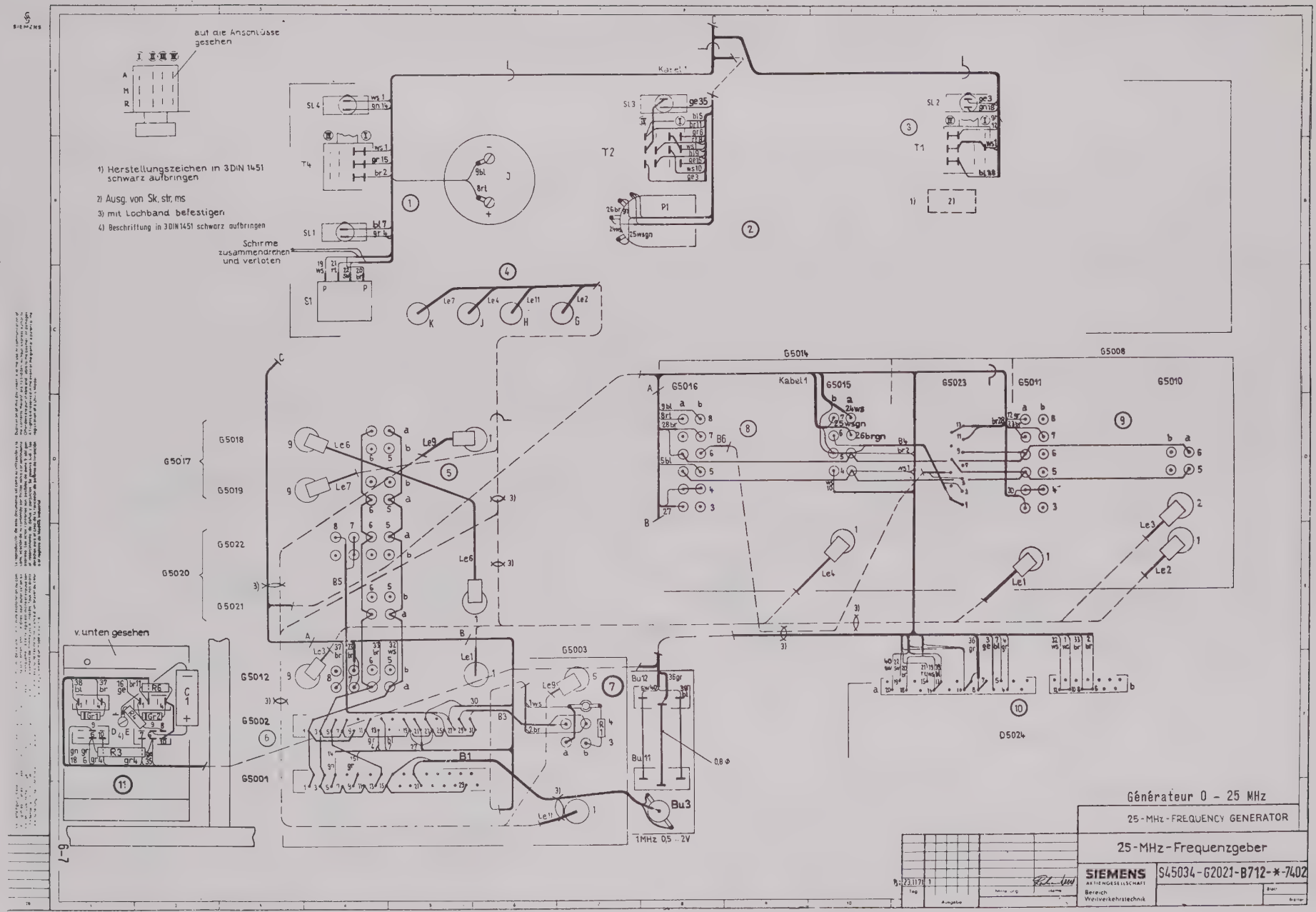
Netzteil-Platte S45035-D5025-A711-3

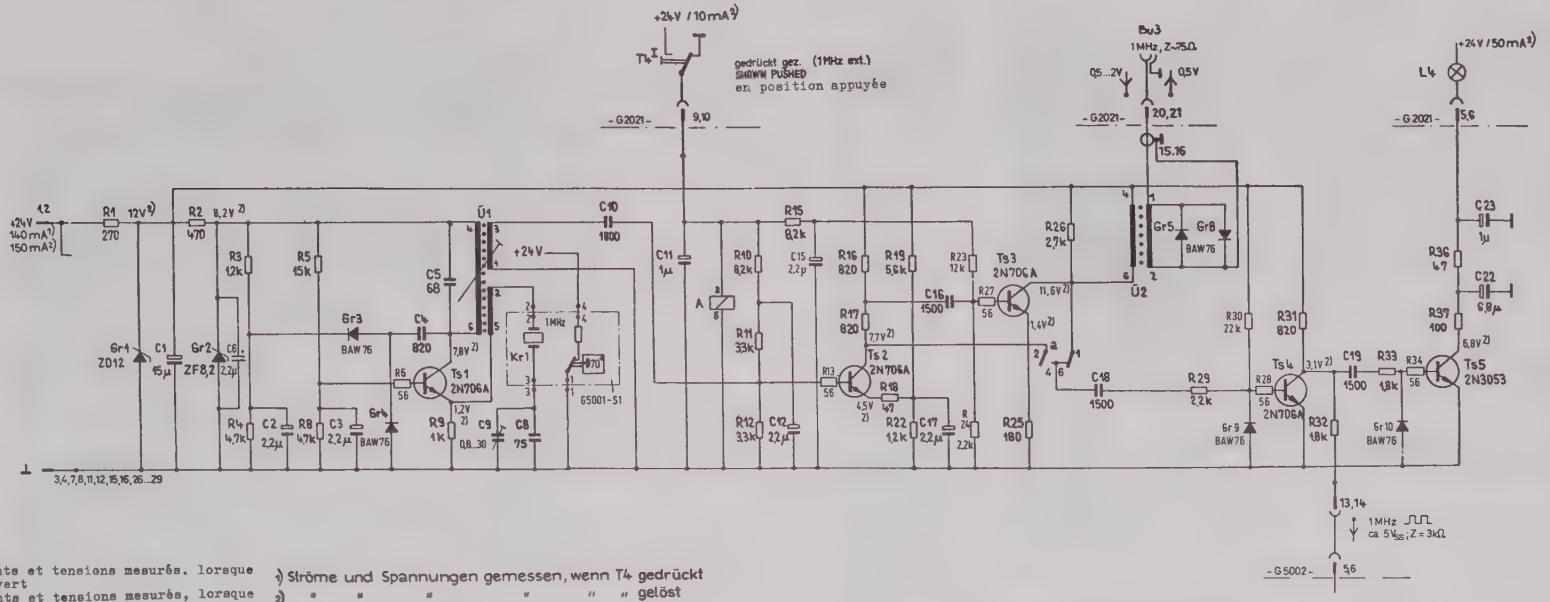
POWER SUPPLY BOARD

		Schichtwiderstand LAYER-TYPE RESISTOR	
R 1,2,9, 10,11, 17,23	7	1k Ohm±5%; 0,33W	B54413-A2102-J
R 3,4, 15,16	4	1 Ohm±5%; 1W	B54415-A2010-J
R 5	1	820 Ohm±5%; 0,33W	B54413-A2821-J
R 8	1	6,2k Ohm±5%; 0,5W	B51263-A2622-J
R 12	1	10 Ohm±5%; 0,33W	B54413-A2100-J
R 18	1	680 Ohm±5%; 0,33W	354413-A2681-J
R 19	1	150 Ohm±5%; 0,33W	B54413-A2151-J
R 22	1	1,8k Ohm±5%; 0,5W	B51263-A2182-J
R 25	1	1,5k Ohm±5%; 0,5W	B51263-A2152-J
		Schichtdrehwiderstand LAYER-TYPE VAR RESISTOR	
R 24	1	470 Ohm±20%; 1W	V44215-Z3009-A6
		Elko ELECTROLYTIC CAPACITOR	
C 4	1	220/uF+50-10%;40V	B41588-A7227-T
		MKM-Kondensator MKM-CAPACITOR	
C 5	1	0,1/uF±20%; 160V	B32435-A2104-M
		Elko ELECTROLYTIC CAPACITOR	
C 6	1	47/uF+50-10%; 40V	B41588-A7476-T
		Gleichrichter RECTIFIER	
Gr 3	1	30V/90mA	Q70-F2716
		Diode DIODE	
Gr 4,5	2	BAW 76	Q62702-A397
		Zenerdiode ZENER DIODE	
Gr 8,9	2	U_z=6,8V	V42292-Z4-A13
Gr 10	1	U_z=6,2V	V42292-Z4-A12
		Transistor TRANSISTOR	
Ts 1,4	2	2 N 3054	Q62702-U7
Ts 5,8	2	2 N 3053	Q62702-L15


Baugruppennummer in Kurzschreibweise z.B.
SYMBOLIZED SUBASSEMBLY DESIGNATION e.g. G5006
Vollständige Sachnummer
COMPLETE ITEM NUMBER S45035-G5006-A711
numéros des sous-ensembles en abrévia tion par example "G 5006"
Numérotation complète S45035-G5006-A711
en position appuyée
T1 fgerastet locked verrouillé gedrückt gez. SHOWN PUSHED
T2 fgerastet locked verrouillé "
T4 1MHz ext. "
G 5003
G 5007
G 5006
G 5008
G 5011
G 5010
G 5012
D5024
G 5020
G 5022
G 5021
G 5001
G 5002
G 5016
G 5014
G 5015
G 5017
G 5019
G 5018
G 5023
100 kHz 1Vss / 75Ω
45-70 MHz 0dBm / 75Ω
42,6-42,5 MHz 0dBm / 75Ω
42,6-42,5 MHz -9dB / 75Ω
45-70 MHz -9dB / 75Ω
100 kHz 2Vss / 200Ω
1 MHz ~75Ω 0,5-2V
1 MHz 5Vss / 3kΩ
1kHz 5Vss / 400Ω
10-0,9 MHz -9dB / 10Ω
41,6 MHz -9dB / 75Ω
Wobbeloszillator SWEEP OSC Oscillateur wobbulé
Normal Frequ.1MHz
STAND. FREQUENCY
Fréquence standard
Netz / POWER Secteur 110 ··· 235 V
Générateur 0 - 25 MHz
Frequenzgeber 0-25 MHz
FREQUENCY GENERATOR 0-25 MHz
SIEMENS AKTIENGESELLSCHAFT
Bereich Weitverkehrstechnik
S 45034-G 2021-B712-A-7411


1MHz/ ~75Ω
1.. 5Vss
1Vss
100kHz 1Vss / 75Ω
45..70MHz 0dBm / 75Ω
42,6..42,5MHz 0dBm / 75Ω
f1
f3
G5003
G5007
G5006
G5006
45..70MHz -9dB / 75Ω
42,6..42,5MHz -9dB / 75Ω
f1 0...25MHz
G5008
G5009
G5010
Wobbelosz. SWEEP OSC Oscillateur wobbulé
100kHz 2Vss / 75Ω
45..70MHz -9dB/75Ω
45..70MHz -9dB / 75Ω
SL2
n x 0,1 MHz
G5012
41,6MHz
G5021
G5022
G5020
41,6 MHz -9dB/75Ω
1MHz 5Vss / 3kΩ
100kHz 2Vss / 200Ω
1kHz 55Vss / 400Ω
f2 0...100kHz
0 Hz
1,0..0,9MHz
10..0,9MHz -9dB/~10Ω
G5015
500Hz
500Hz
G5023
20Hz
2MHz
600Hz
42,6..42,5MHz
G5019
G5018
G5017
f3
110...235V
D5024
+24V
G5001
1MHz
f0
G5002
G5016
G5014
SL4
Fréquence standard
Norm Frequ
STAND FREQ
1MHz
SL3
Hz
n x 1kHz
Wobbelosz. SWEEP OSC Oscillateur wobbulé
T1 f1 gerastet LOCKED Verrouillé
T2 f2 gerastet LOCKED Verrouillé
T4 1MHz ext.
Générateur 0 - 25 MHz
FREQUENCY GENERATOR 0-25 MHz
Frequenzgeber 0-25MHz
SIEMENS AKTIENGESELLSCHAFT
Bereich Wehrtechnik
S45034-G2021-B712-*-7412
6-5


auf die Anschlüsse gesehen
1) Herstellungszeichen in 3DIN 1451 schwarz aufbringen
2) Ausg. von Sk, str, ms
3) mit Lochband befestigen
4) Beschriftung in 3DIN 1451 schwarz aufbringen
Schirme zusammendrehen und verloten
Kabel 1
T1
T2
T4
S1
P1
Z1
G5014
G5016
G5015
G5023
G5011
G5010
G5008
G5018
G5017
G5019
G5022
G5020
G5021
G5012
G5002
G5001
G5003
B1
B3
B5
B6
Bu3
1MHz 0,5 .. 2V
v. unten gesehen
D5024
Générateur 0 - 25 MHz
25-MHz-FREQUENCY GENERATOR
25-MHz-Frequenzgeber
SIEMENS AKTIENGESELLSCHAFT
Bereich Weitverkehrstechnik
S45034-G2021-B712-*-7402
6-7



1) Courants et tensions mesurés, lorsque T4 ouvert
2) Courants et tensions mesurés, lorsque T4 fermé

Tolérances des indications de courant et tension ±5 %
Appareil: µA-MULTIZET (Ri >50 kΩ/V)

¹) Ströme und Spannungen gemessen, wenn T4 gedrückt
²) " " " " " " gelöst

Toleranz der Strom- und Spannungsangaben ± 5%
Instrument: µA-Multizet (Ri≧ 50kΩ/V)

1) CURRENTS AND VOLTAGES ARE MEASURED IF T4 IS PUSHED
2) " " " " " " " RESTORED TO NORMAL

TOLERANCE OF THE CURRENT AND VOLTAGE INDICATIONS ±5%
INSTRUMENT: µA-MULTIZET (Zi≧50kΩ/V)

Oscillateur F_0 pour Générateur

f_0-OSCILLATOR
FOR FREQUENCY GENERATOR

f_0-Oszillator
für Frequenzgeber S45034-G2021

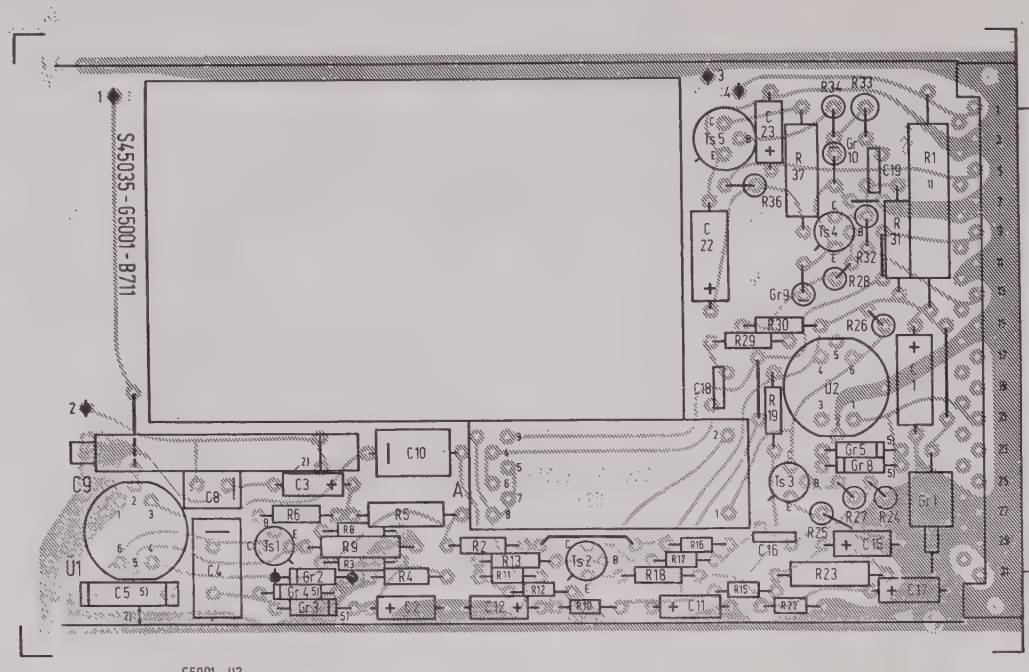
SIEMENS AKTIENGESELLSCHAFT
Bereich Weitverkehrstechnik

S45035-G5001-B711-*-7411

7	2272	2	542/1249	
8	2311	1		
	Tag	Ausgabe	Änderung	Name

6-9

SIEMENS



Oscillateur F_0 pour Générateur

f_0 - Oszillator 1MHz für 62021

2.2.72	2	Bl 1.2	5427/1249	SIEMENS	S45035-G5001-B711-*-7402		
23.11.71	1	Bl 1.2		Bereich Werkverkehrstechnik		Blatt 1	
Tag	Ausgabe	Mitteilung	Name			2	Blätter

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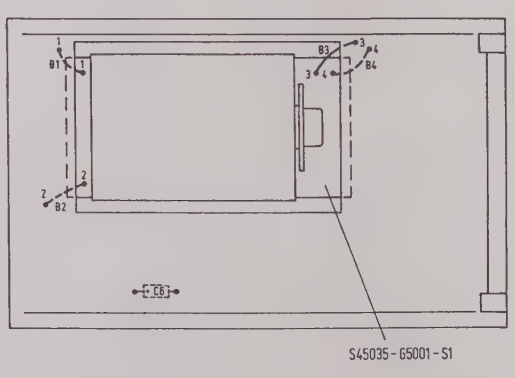
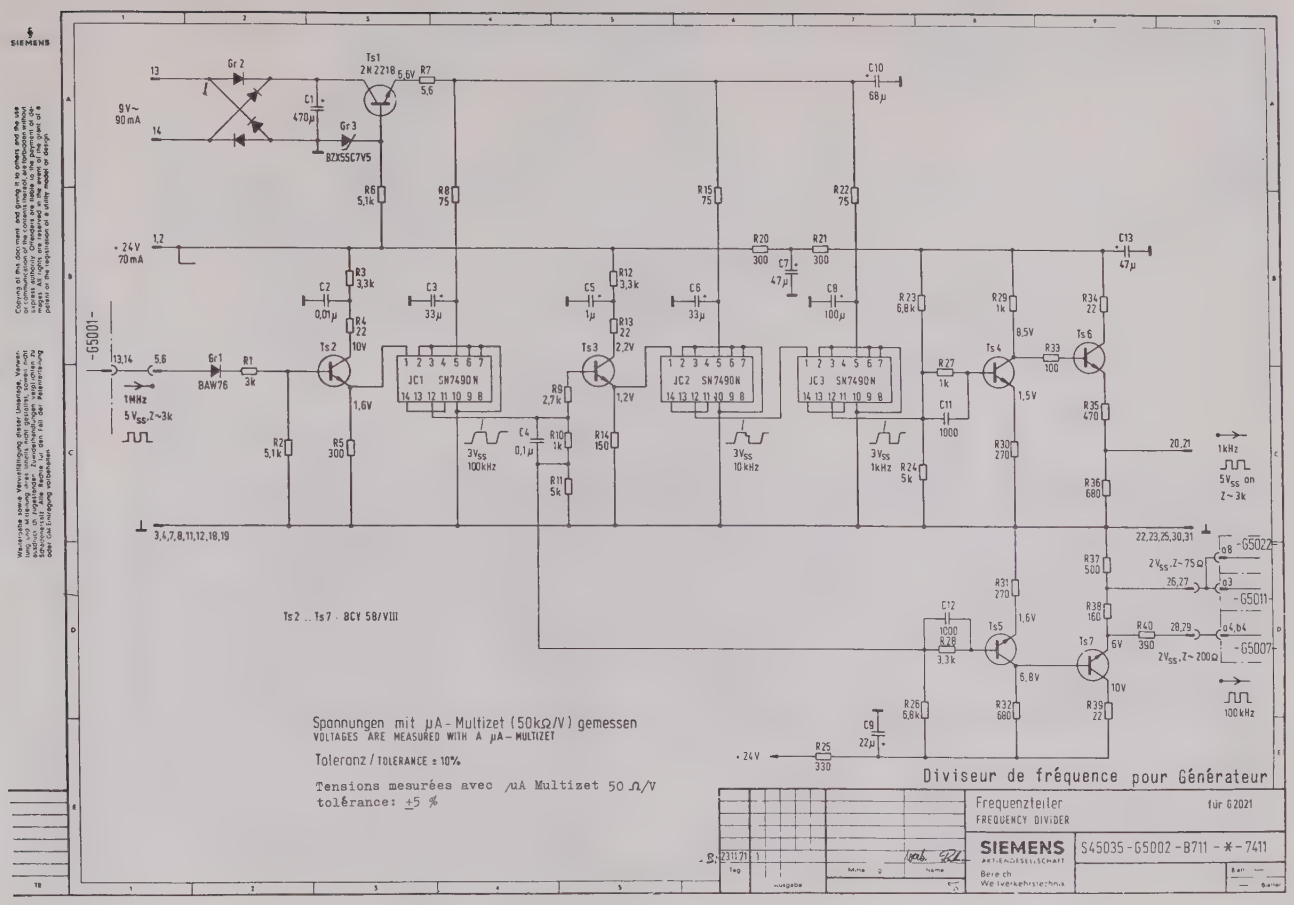


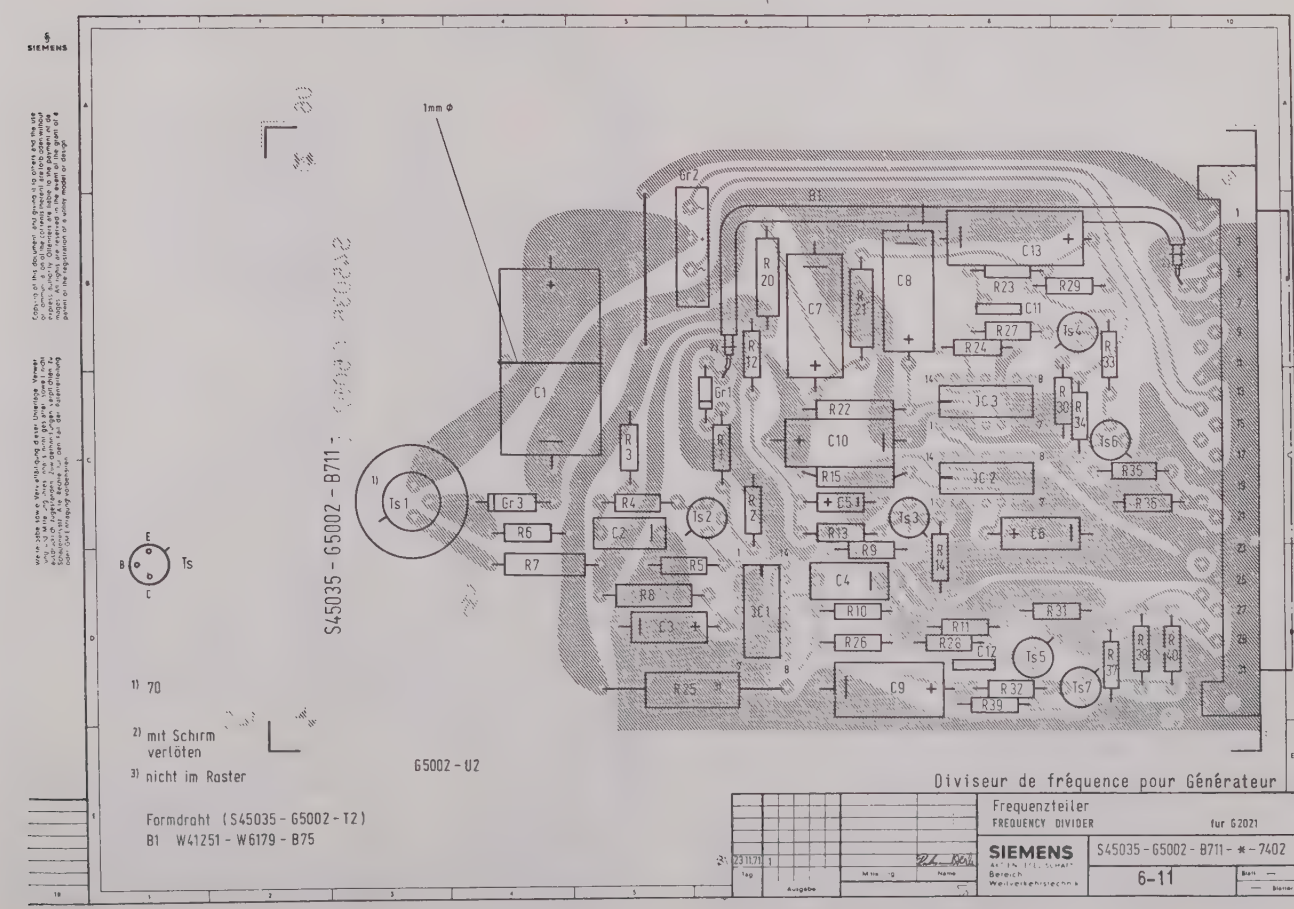
Formdraht (S45035-G5001-T2)
B1...4 1DIN 47412 gn mit Bewegungsschleife verlegen

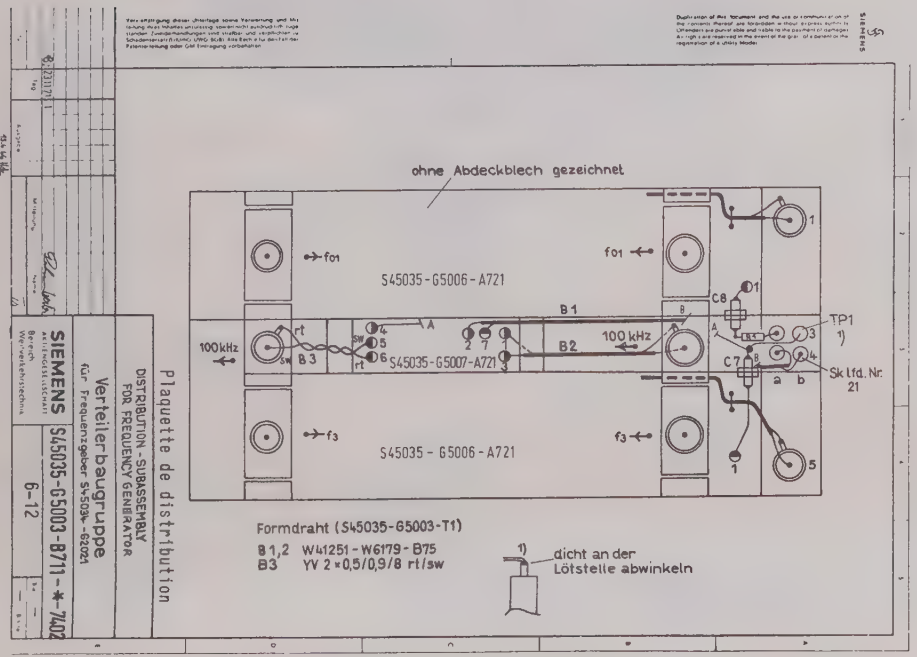
Oscillateur f_0 pour Générateur

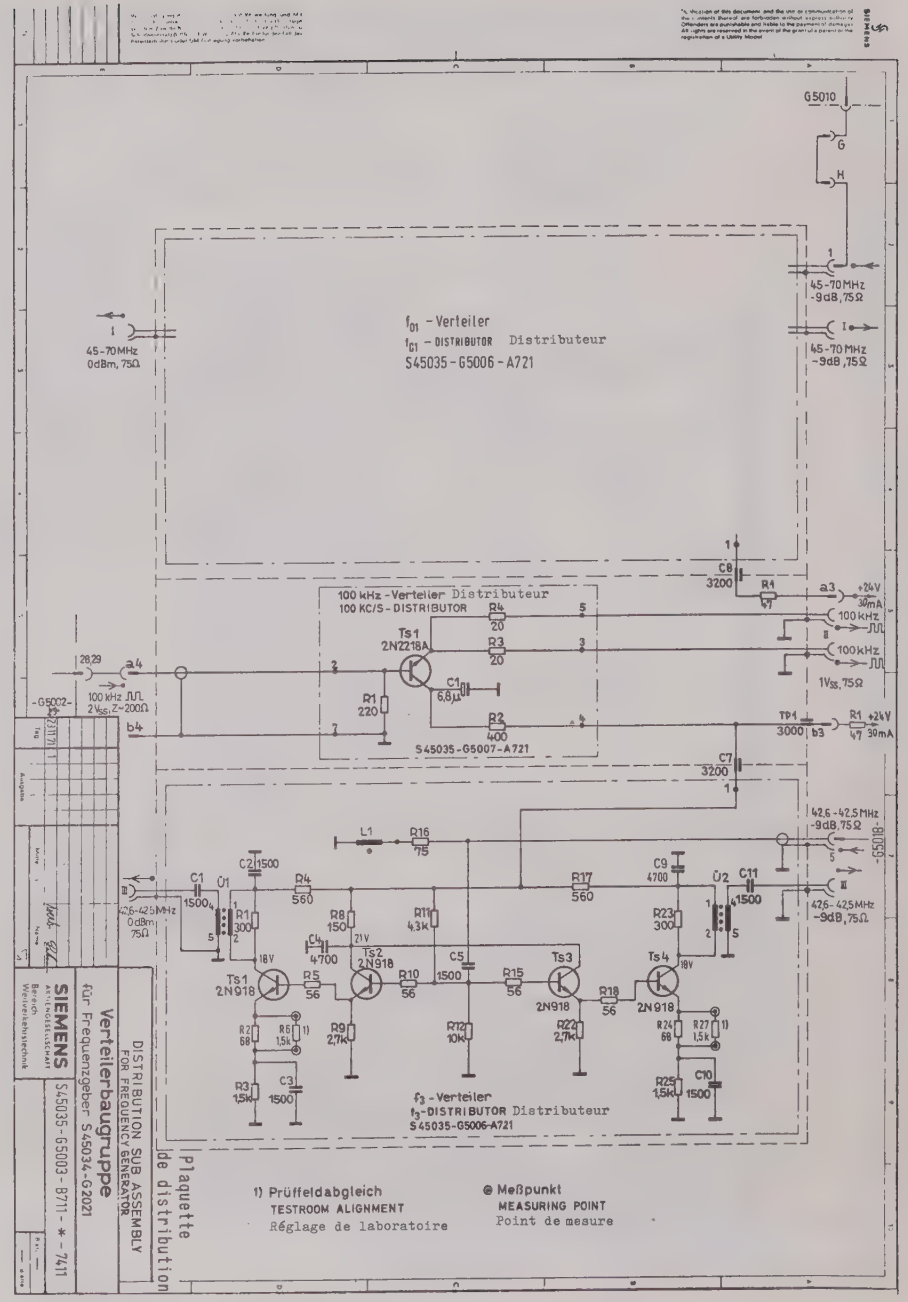
f_0 – Oszillator 1MHz für 62021

2.2.72			5427/1249	SIEMENS AKTIENGESELLSCHAFT	S45035-G5001-B711-*-7402		
23.11.71				Bereich Werkverkehrstechnik	6-10	Blatt 2	
Tag	Ausgabe	Mitteilung	Name				Blätter


Gr 2
Ts1 2N2218
6,6V
R7 5,6
C10 68µ
C1 470µ
Gr 3 BZX55C7V5
9V~ 90mA
R6 5,1k
R8 75
R15 75
R22 75
+24V 70mA
R20 300
R21 300
C13 47µ
C7 47µ
C2 0,01µ
R3 3,3k
C3 33µ
C5 1µ
R12 3,3k
C6 33µ
C8 100µ
R23 6,8k
R29 1k
R34 22
R4 22
R13 22
2,2V
8,5V
Ts4
R33 100
Ts6
1,5V
R27 1k
C11 1000
R35 470
R30 270
20,21
1kHz 5Vss on Z~3k
13,14
5,6
Gr1 BAW76
R1 3k
1MHz 5Vss Z~3k
Ts2
Ts3
JC1 SN7490N
JC2 SN7490N
JC3 SN7490N
1,6V
1,2V
R9 2,7k
C4 0,1µ
R10 1k
R14 150
R11 5k
R24 5k
3Vss 100kHz
3Vss 10kHz
3Vss 1kHz
R2 5,1k
R5 300
R36 680
3,4,7,8,11,12,18,19
22,23,25,30,31
R37 500
2Vss Z~75Ω
26,27
-G5022
-G5011
-G5007
R31 270
C12 1000
R28 3,3k
Ts5
1,6V
R38 160
R40 390
28,29
2Vss Z~200Ω
Ts7
6V
5,8V
10V
100kHz
R26 6,6k
R32 680
R39 22
C9 22µ
+24V
R25 330
Ts2 .. Ts7 : BCY 58/VIII
Spannungen mit µA-Multizet (50kΩ/V) gemessen
VOLTAGES ARE MEASURED WITH A µA-MULTIZET
Toleranz / TOLERANCE ± 10%
Tensions mesurées avec µA Multizet 50 Ω/V
tolérance: ±5 %
Diviseur de fréquence pour Générateur
Frequenzteiler
FREQUENCY DIVIDER
für G2021
SIEMENS
S45035-G5002-B711-*-7411


1mm Ø
Gr2
B1
C13
R23
R29
C11
R27
R24
Ts4
R33
JC3
R22
C10
R15
JC2
R35
R36
C6
C7
C8
R20
R21
C1
R3
Gr1
Gr3
R6
R7
C2
Ts2
R5
R8
JC1
C3
R4
Ts1
1)
E
B
C
Ts
C4
R10
R11
R26
C12
R31
Ts5
Ts7
R32
R39
C9
R25
R9
R13
Ts3
R14
S45035-G5002-B711-
1) 70
2) mit Schirm vertöten
3) nicht im Raster
G5002-U2
Formdraht (S45035-G5002-T2)
B1 W41251-W6179-B75
Diviseur de fréquence pour Générateur
Frequenzteiler
FREQUENCY DIVIDER
für G2021
SIEMENS
S45035-G5002-B711-*-7402
6-11


ohne Abdeckblech gezeichnet
S45035-G5006-A721
S45035-G5007-A721
S45035-G5006-A721
B1
B2
B3
100kHz
100 kHz
TP1
1)
Sk Lfd. Nr. 21
Formdraht (S45035-G5003-T1)
B1,2 W41251-W6179-B75
B3 YV 2×0,5/0,9/8 rt/sw
1) dicht an der Lötstelle abwinkeln


f01 - Verteiler
f01 - DISTRIBUTOR Distributeur
S45035-G5006-A721
45-70MHz 0dBm, 75Ω
45-70MHz -9dB, 75Ω
100 kHz-Verteiler Distributeur
100 KC/S-DISTRIBUTOR
S45035-G5007-A721
100 kHz 2Vss, Z=200Ω
1Vss, 75Ω
+24V 30mA
42,6-42,5MHz 0dBm 75Ω
42,6-42,5MHz -9dB, 75Ω
426-425MHz -9dB, 75Ω
f3-Verteiler
f3-DISTRIBUTOR Distributeur
S45035-G5006-A721
1) Prüffeldabgleich
TESTROOM ALIGNMENT
Réglage de laboratoire
Meßpunkt
MEASURING POINT
Point de mesure

SIEMENS

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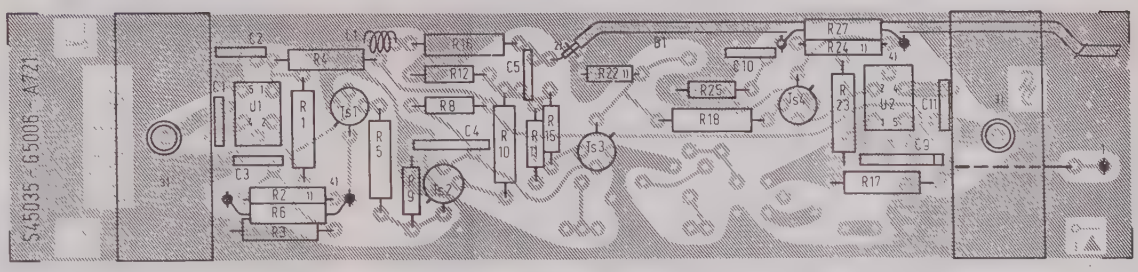


G5004 - U1

3) vor dem Schwallen an Buchse anlöten

Cu - Draht versilbert 0,8mm Φ

4)

50

E B Ts C

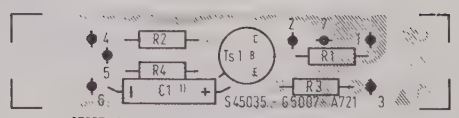
1) nicht im Raster 2) mit Schirm verloten

Formdraht (S45035 - G5006 - T1)
B1 W41251 - W6179 - B75 (125mm lg)

Distributeur

f_{01} / f_3 - Verteiler
f_{01} / f_3 - DISTRIBUTOR für G2021

SIEMENS S45035 - G5006 - A721 - * - 7402



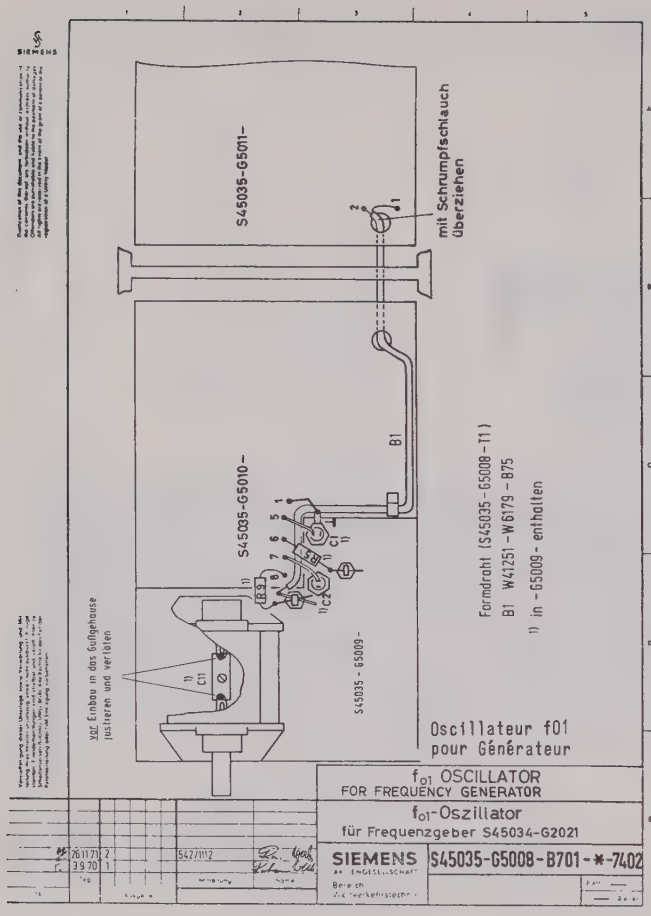
G5007 - U1

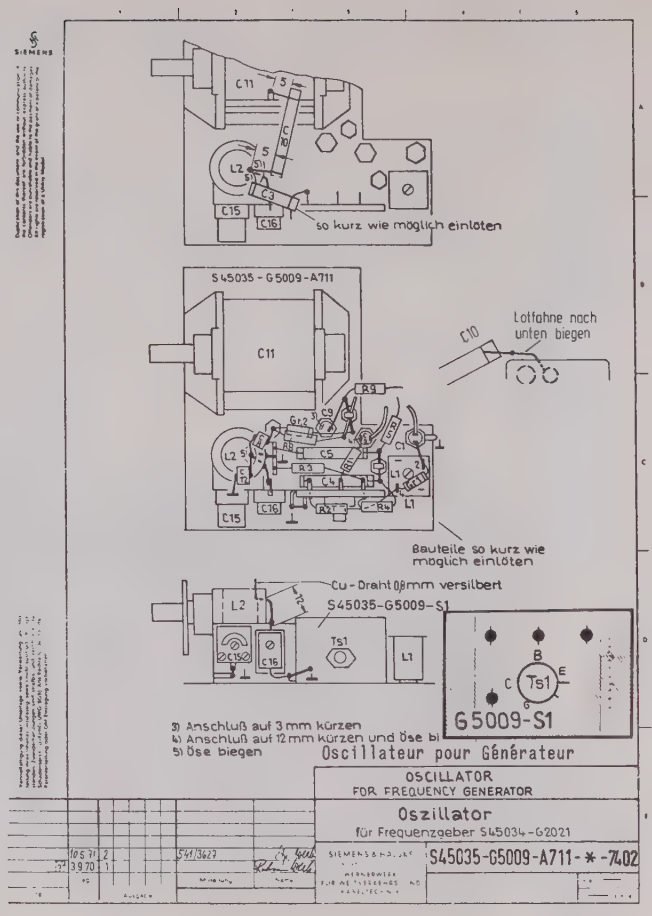
Distributeur 100 kHz

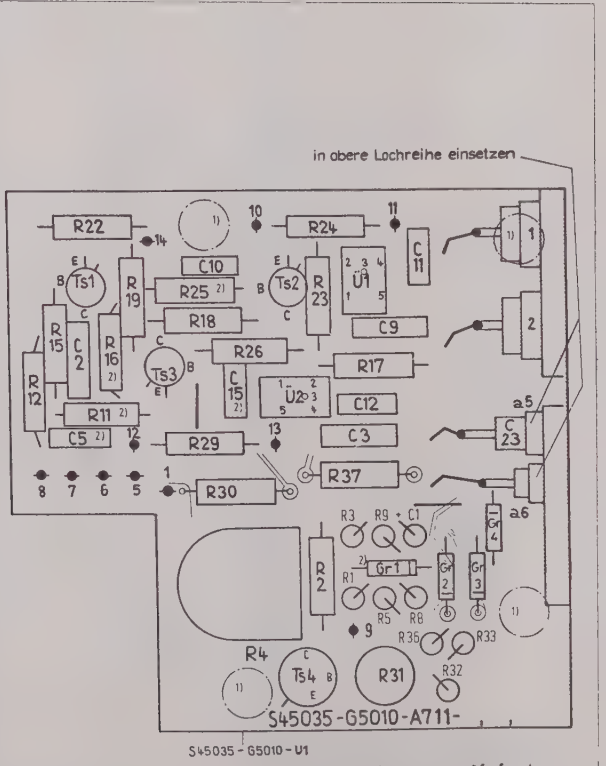
100 - kHz - Verteiler
100 - kHz DISTRIBUTER für G2021

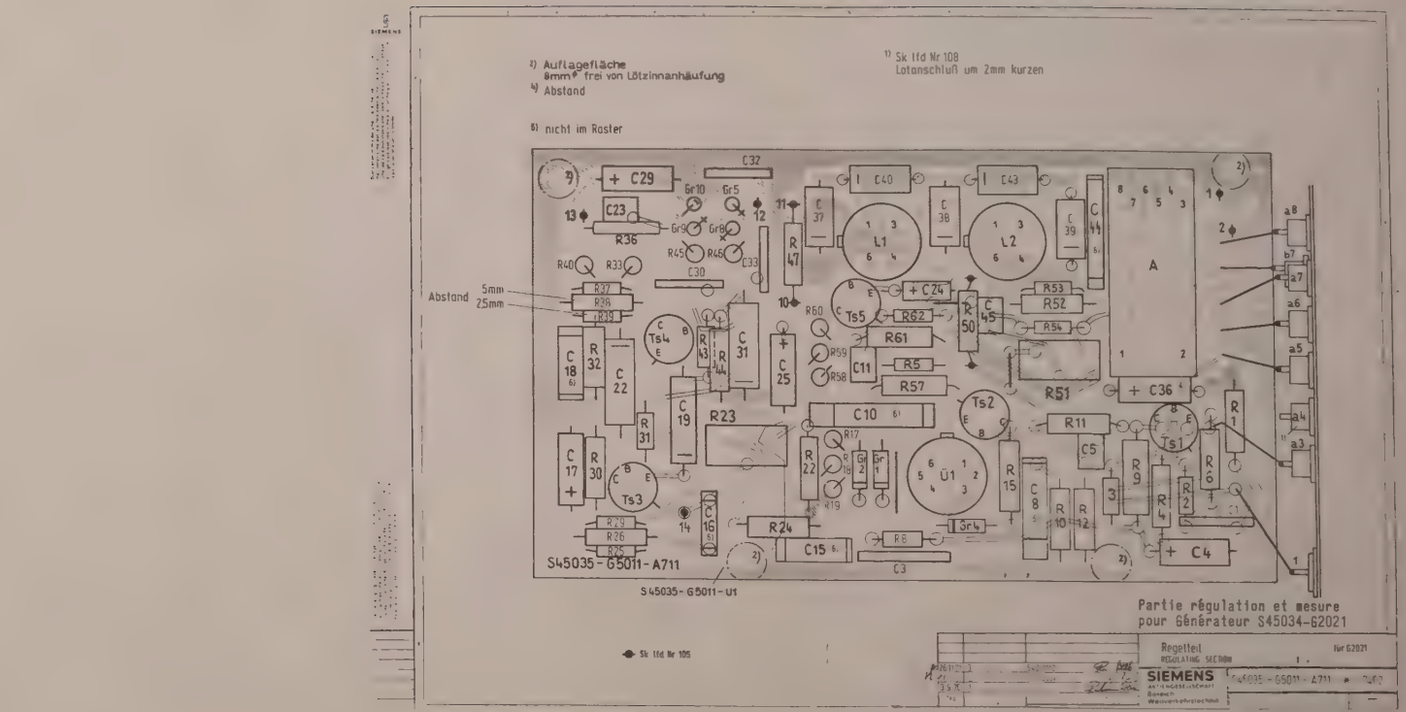
SIEMENS S45035 - G5007 - A721 - * - 7402

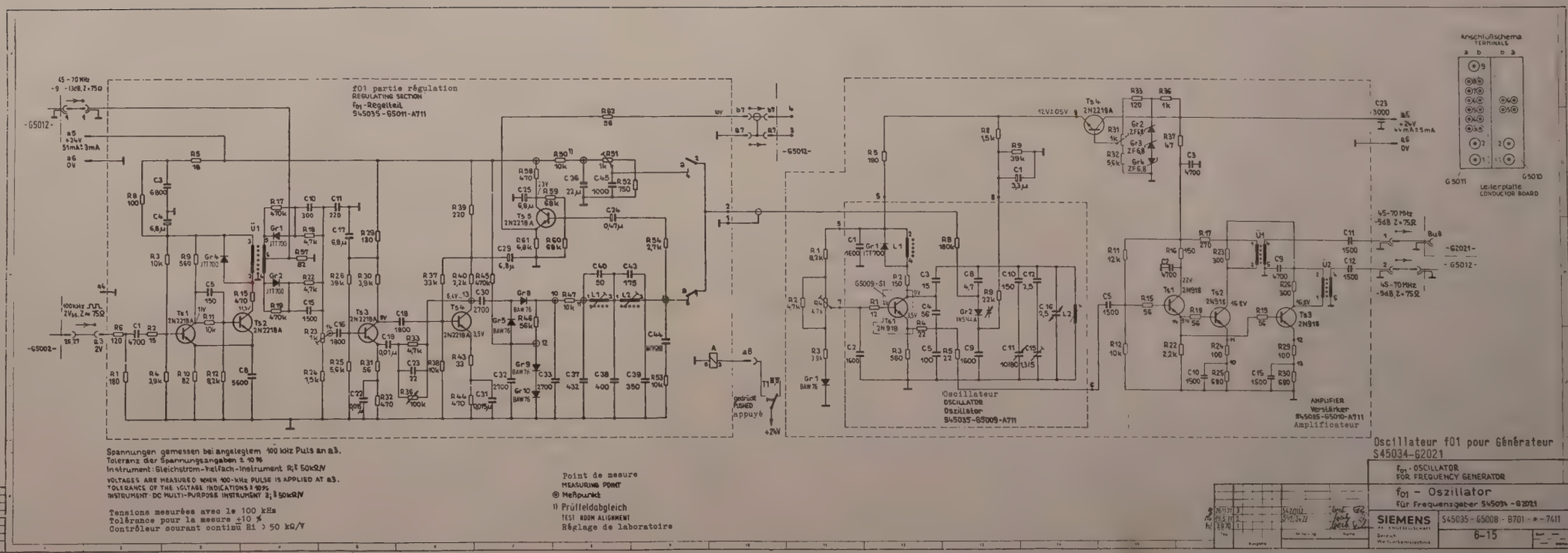
6-13

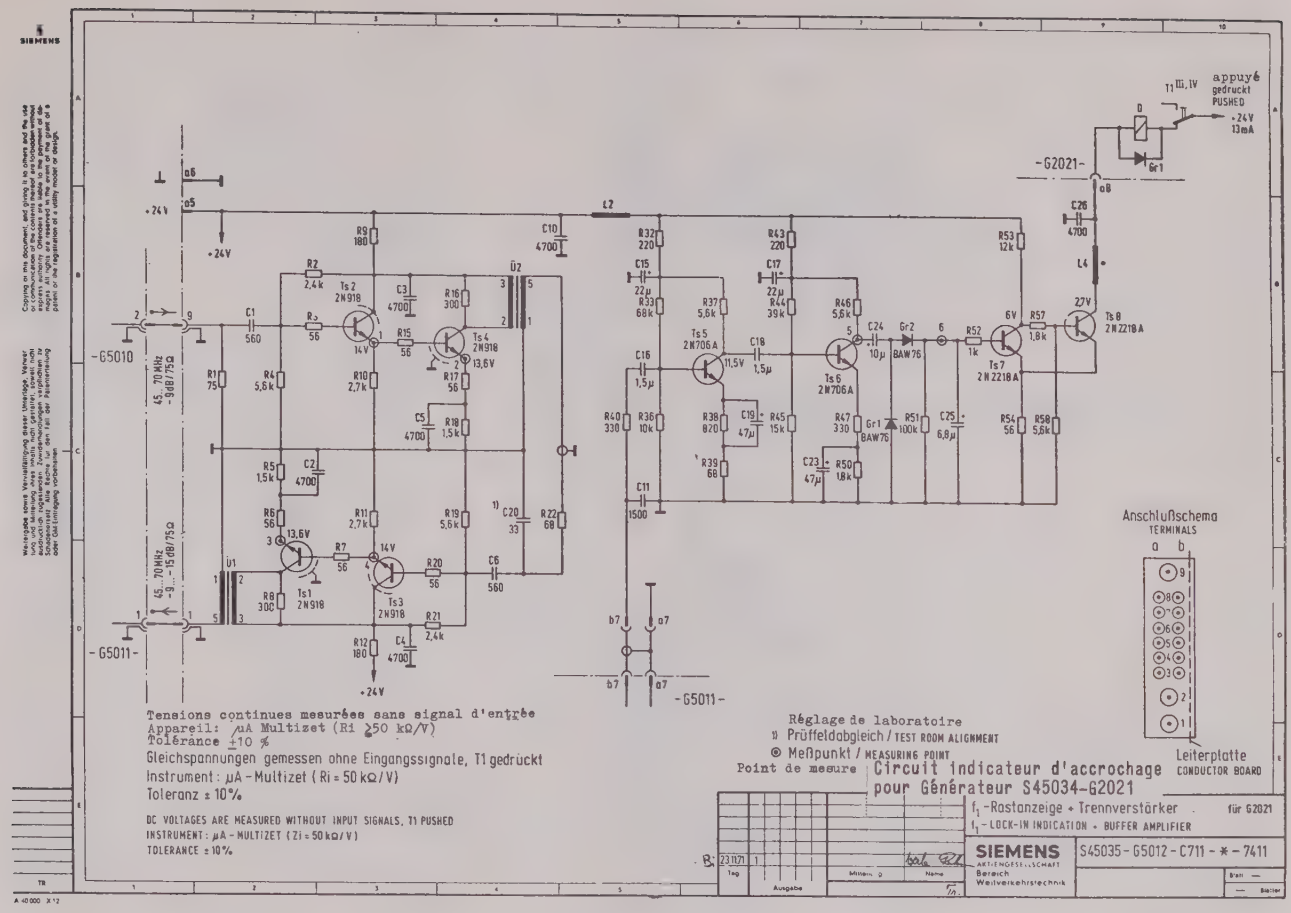

S45035-G5011-
mit Schrumpfschlauch überziehen
S45035-G5010-
B1
S45035-G5009-
Formdraht (S45035-G5008-11)
B1 W41251-W6179-B75
11) in -G5009- enthalten
10C Einbau in das Gußgehäuse justieren und verlöten
Oscillateur f01
pour Générateur
f01 OSCILLATOR
FOR FREQUENCY GENERATOR
f01-Oszillator
für Frequenzgeber S45034-G2021
SIEMENS
S45035-G5008-B701-*-7402

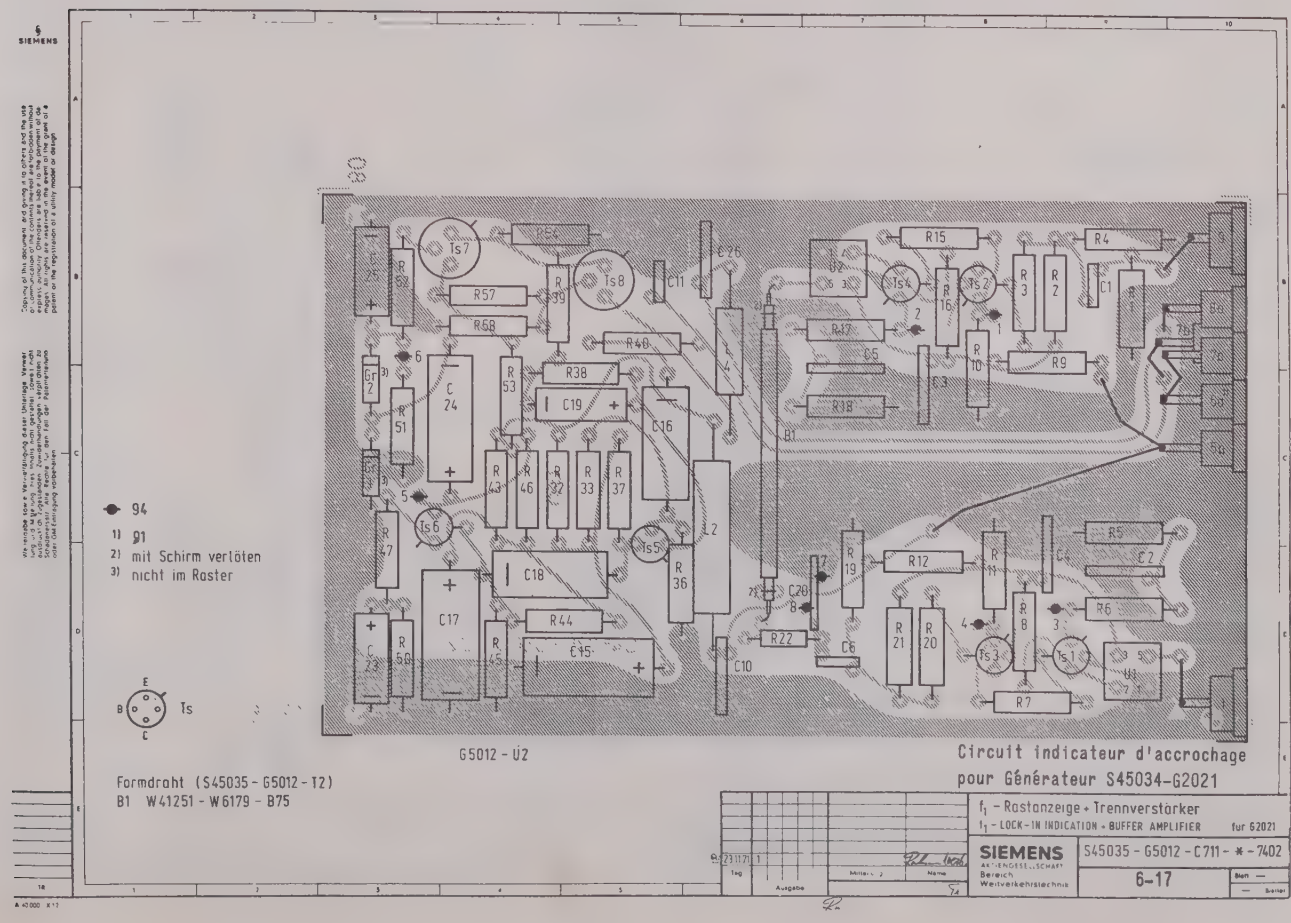

so kurz wie möglich einlöten
S45035-G5009-A711
Lotfahne nach unten biegen
Bauteile so kurz wie möglich einlöten
Cu-Draht Ø8mm versilbert
S45035-G5009-S1
G5009-S1
3) Anschluß auf 3 mm kürzen
4) Anschluß auf 12 mm kürzen und öse bi
5) Öse biegen
Oscillateur pour Générateur
OSCILLATOR
FOR FREQUENCY GENERATOR
Oszillator
für Frequenzgeber S45034-G2021
S45035-G5009-A711-*-7402

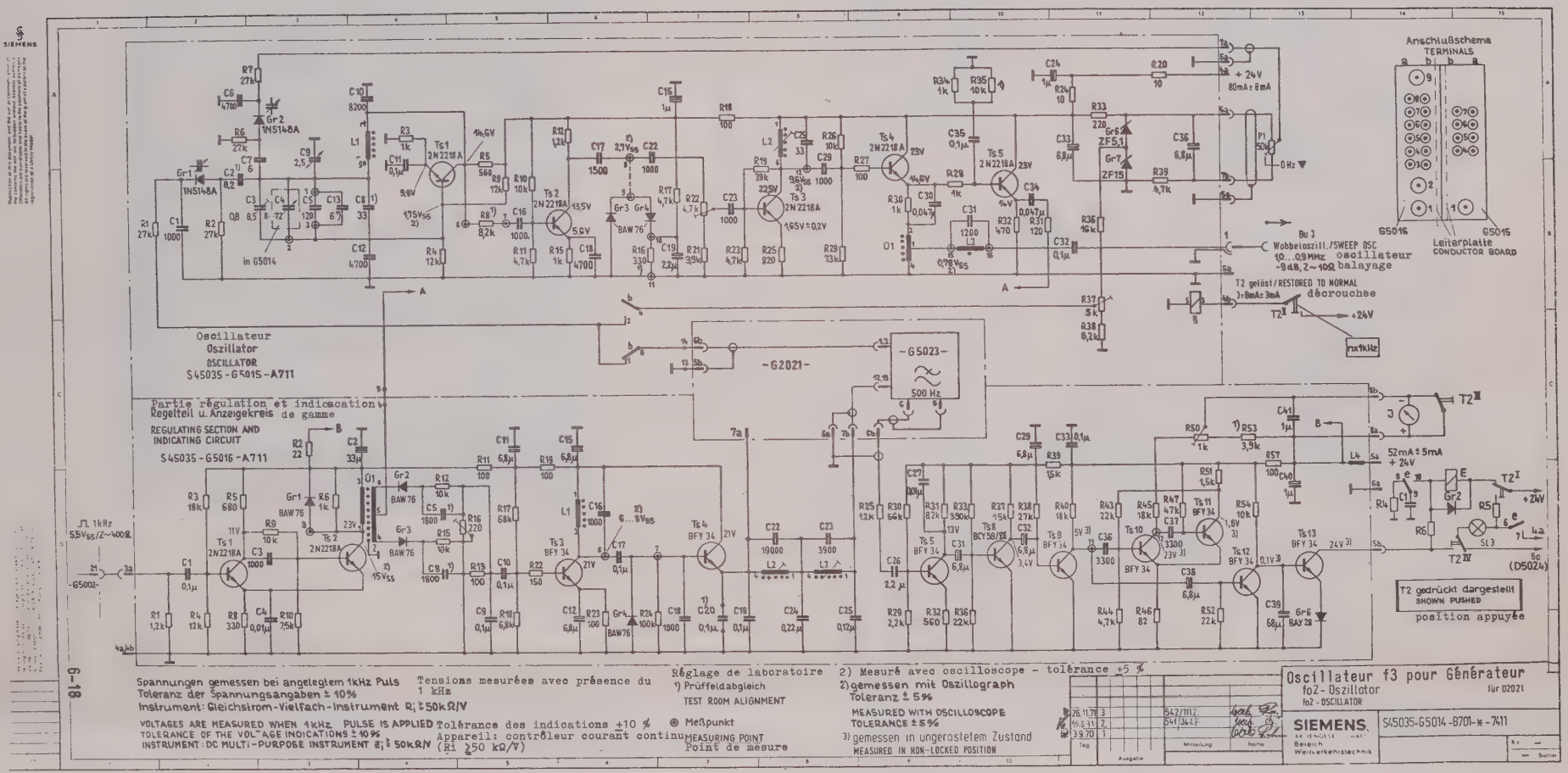

in obere Lochreihe einsetzen
S45035-G5010-A711-
S45035-G5010-U1
Amplificateur pour Générateur
Verstärker
AMPLIFIER
für G2021
SIEMENS
S45035-G5010-A711-*-7402
6-14

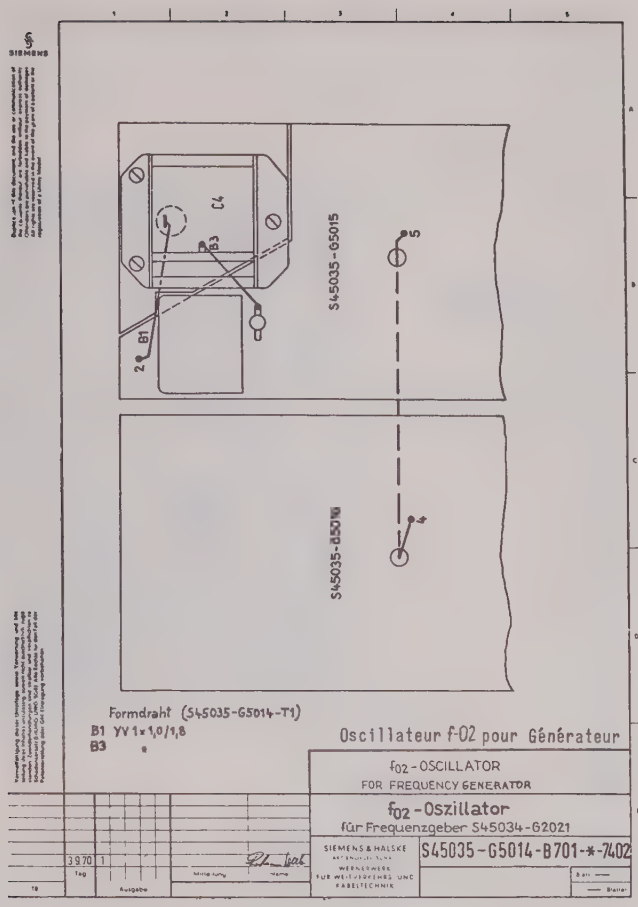

2) Auflagefläche
8mm² frei von Lötzinnanhäufung
4) Abstand
6) nicht im Raster
11) Sk lfd Nr 108
Lotanschluß um 2mm kurzen
Abstand 5mm
25mm
S45035-G5011-A711
S45035-G5011-U1
Sk lfd Nr 105
Partie régulation et mesure
pour Générateur S45034-G2021
Regeltei
REGULATING SECTION
SIEMENS

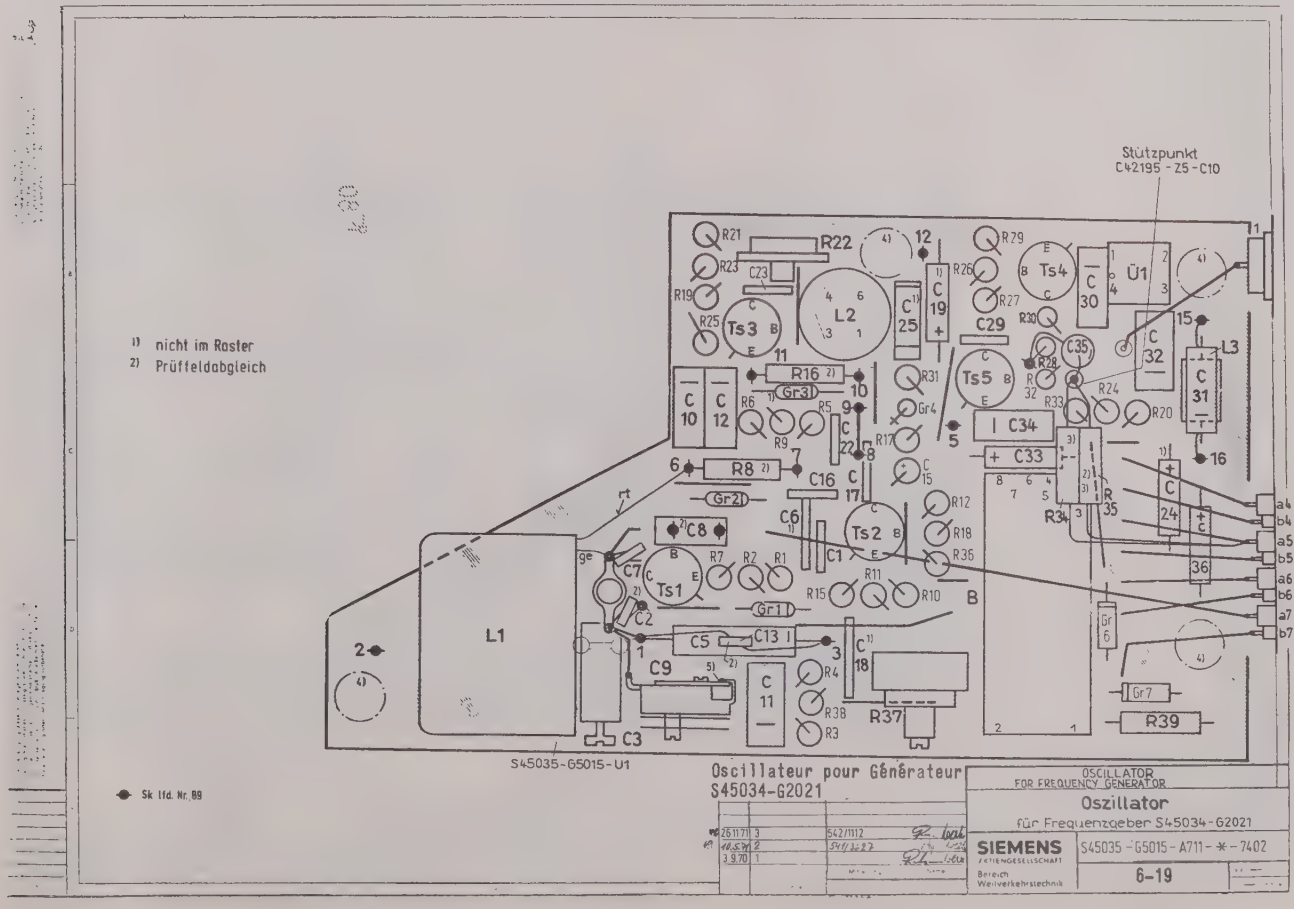

f01 partie régulation
REGULATING SECTION
f01-Regelteil
S45035-G5011-A711
45-70 MHz
-9 -13dB, Z=75Ω
-G5012-
a5 +24V 51mA ±3mA
a6 0V
100kHz
2Vss, Z=75Ω
a3 2V
a8
gedrückt
PUSHED
appuyé
+24V
Oscillateur
OSCILLATOR
Oszillator
S45035-G5009-A711
AMPLIFIER
Verstärker
S45035-G5010-A711
Amplificateur
12V ±0.5V
+24V ±5mA
-G2021-
45-70 MHz
-9dB, Z=75Ω
Anschlußschema
TERMINALS
Leiterplatte
CONDUCTOR BOARD
G5011
G5010
Spannungen gemessen bei angelegtem 100 kHz Puls an a3.
Toleranz der Spannungsangaben ± 10 %
Instrument: Gleichstrom-Vielfach-Instrument Ri ≥ 50kΩ/V
VOLTAGES ARE MEASURED WHEN 100-kHz PULSE IS APPLIED AT a3.
TOLERANCE OF THE VOLTAGE INDICATIONS ± 10%
INSTRUMENT: DC MULTI-PURPOSE INSTRUMENT Ri ≥ 50kΩ/V
Tensions mesurées avec le 100 kHz
Tolérance pour la mesure ±10 %
Contrôleur courant continu Ri ≥ 50 kΩ/V
Point de mesure
MEASURING POINT
Meßpunkt
1) Prüffeldabgleich
TEST ROOM ALIGNMENT
Réglage de laboratoire
Oscillateur f01 pour Générateur
S45034-G2021
f01 - OSCILLATOR
FOR FREQUENCY GENERATOR
f01 - Oszillator
für Frequenzgeber S45034-G2021
SIEMENS
S45035-G5008-B701-*-7411
6-15

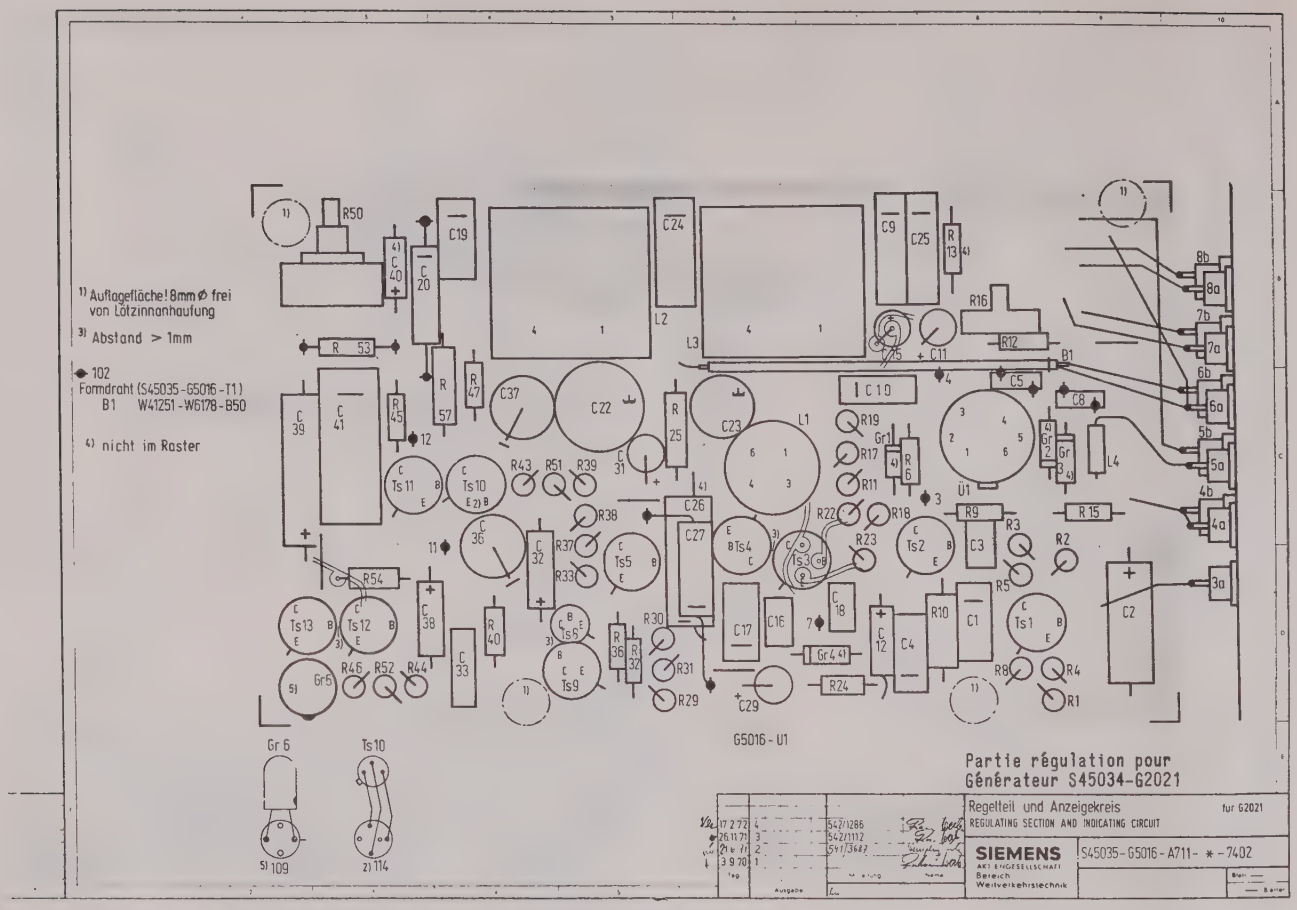

SIEMENS
T1 III, IV
appuyé
gedrückt
PUSHED
+24V
13mA
-G2021-
Gr1
a8
a6
a5
+24V
L2
C26
4700
L4
R9
188
C10
4700
R32
220
R43
220
R53
12k
C15
22µ
C17
22µ
R33
68k
R44
39k
R37
5,6k
R46
5,6k
R2
2,4k
Ü2
Ts2
2N918
C3
4700
R16
300
R15
56
Ts4
2N918
R17
56
13,6V
14V
C1
560
R3
56
-G5010
45...70 MHz
-9dB/75Ω
R1
75
R4
5,8k
R10
2,7k
C5
4700
R18
1,5k
C2
4700
R5
1,5k
R6
56
R11
2,7k
R19
5,6k
C20
33
R22
68
Ü1
R8
300
Ts1
2N918
R7
56
Ts3
2N918
R20
56
C6
560
R21
2,4k
R12
180
C4
4700
-G5011-
+24V
C16
1,5µ
Ts5
2N706A
11,5V
C18
1,5µ
Ts6
2N706A
C24
10µ
Gr2
BAW76
6
R52
1k
6V
R57
1,8k
Ts7
2N2218A
27V
Ts8
2N2218A
R40
330
R36
10k
R38
820
C19
47µ
R45
15k
R47
330
Gr1
BAW76
R51
100k
C25
6,8µ
R54
56
R58
5,6k
R39
68
C23
47µ
R50
1,8k
C11
1500
b7
a7
-G5011-
Anschlußschema
TERMINALS
a b
Leiterplatte
CONDUCTOR BOARD
Tensions continues mesurées sans signal d'entrée
Appareil: µA Multizet (Ri ≥50 kΩ/V)
Tolérance ±10 %
Gleichspannungen gemessen ohne Eingangssignale, T1 gedrückt
Instrument: µA-Multizet (Ri = 50 kΩ/V)
Toleranz ± 10%
DC VOLTAGES ARE MEASURED WITHOUT INPUT SIGNALS, T1 PUSHED
INSTRUMENT: µA-MULTIZET (Zi = 50 kΩ/V)
TOLERANCE ±10%
Réglage de laboratoire
1) Prüffeldabgleich / TEST ROOM ALIGNMENT
◎ Meßpunkt / MEASURING POINT
Point de mesure
Circuit indicateur d'accrochage
pour Générateur S45034-G2021
f1 - Rastanzeige + Trennverstärker
f1 - LOCK-IN INDICATION + BUFFER AMPLIFIER
für G2021
SIEMENS
AKTIENGESELLSCHAFT
Bereich
Weitverkehrstechnik
S45035 - G5012 - C711 - * - 7411
Tag
Ausgabe
Name
Blatt
Blätter

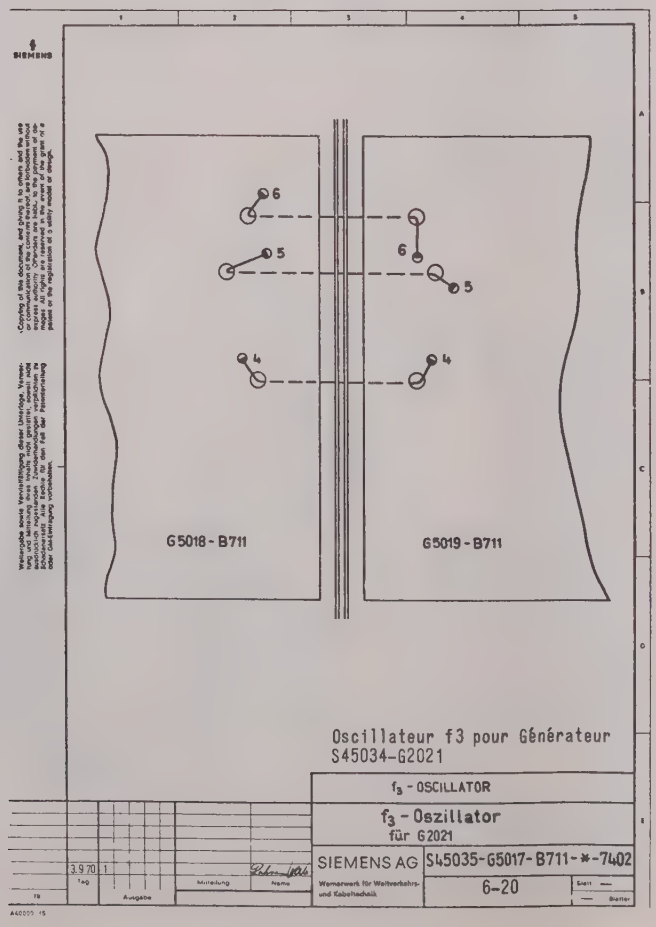

SIEMENS
94
1) 91
2) mit Schirm verlöten
3) nicht im Raster
Ts
E
B
C
G5012 - Ü2
Formdraht (S45035 - G5012 - T2)
B1 W41251 - W6179 - B75
Circuit indicateur d'accrochage
pour Générateur S45034-G2021
f1 - Rastanzeige + Trennverstärker
f1 - LOCK-IN INDICATION + BUFFER AMPLIFIER
für G2021
SIEMENS
AKTIENGESELLSCHAFT
Bereich
Weitverkehrstechnik
S45035 - G5012 - C711 - * - 7402
6-17
Tag
Ausgabe
Name
Blatt
Blätter

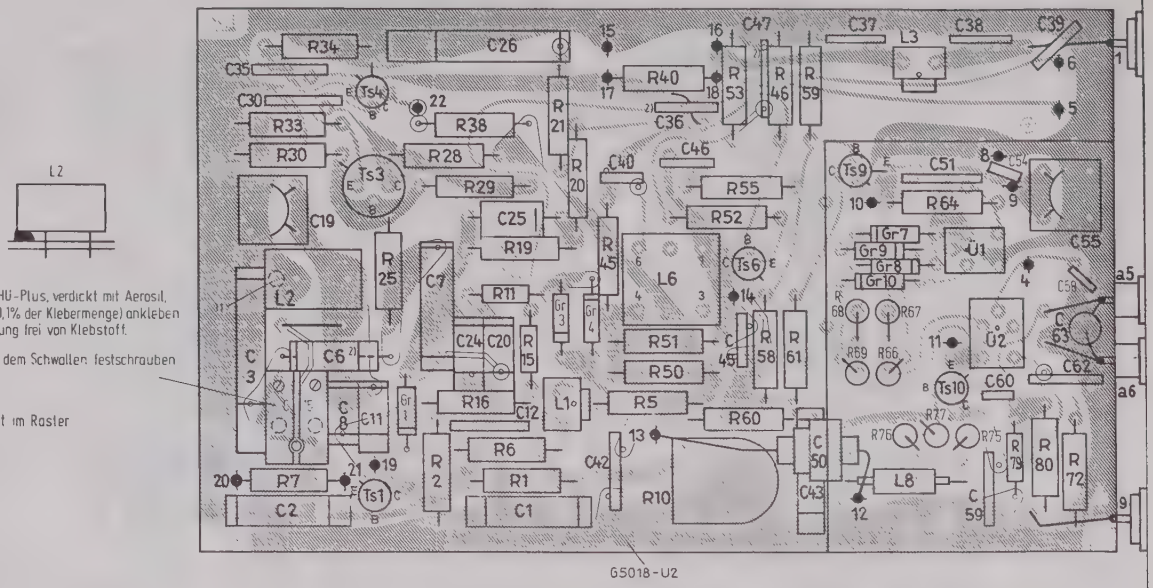

Anschlußschema
TERMINALS
G5016
G5015
Leiterplatte
CONDUCTOR BOARD
Oscillateur
Oszillator
OSCILLATOR
S45035-G5015-A711
Partie régulation et indication
Regelteil u. Anzeigekreis
REGULATING SECTION AND INDICATING CIRCUIT
S45035-G5016-A711
-G2021-
-G5023-
500 Hz
Wobbeloszill./SWEEP OSC
oscillateur balayage
décrouchee
T2 gedrückt dargestellt
SHOWN PUSHED
position appuyée
Spannungen gemessen bei angelegtem 1kHz Puls
Toleranz der Spannungsangaben ± 10%
Instrument: Gleichstrom-Vielfach-Instrument Ri ≥ 50kΩ/V
VOLTAGES ARE MEASURED WHEN 1kHz PULSE IS APPLIED
TOLERANCE OF THE VOLTAGE INDICATIONS ± 10%
INSTRUMENT: DC MULTI-PURPOSE INSTRUMENT Ri ≥ 50kΩ/V
Tensions mesurées avec présence du 1 kHz
Tolérance des indications ±10 %
Appareil: contrôleur courant continu (Ri ≥50 kΩ/V)
Réglage de laboratoire
1) Prüffeldabgleich
TEST ROOM ALIGNMENT
2) Mesuré avec oscilloscope - tolérance ±5 %
2) gemessen mit Oszillograph
Toleranz ± 5%
MEASURED WITH OSCILLOSCOPE
TOLERANCE ± 5%
3) gemessen in ungerastetem Zustand
MEASURED IN NON-LOCKED POSITION
Point de mesure
MEASURING POINT
Oscillateur f3 pour Générateur
fo2-Oszillator
für D2021
fo2 - OSCILLATOR
SIEMENS
S45035-G5014-B701-*-7411
6-18


S45035-G5015
S45035-G5015
B3
C4
B1
2
5
4
Formdraht (S45035-G5014-T1)
B1 YV1x1,0/1,8
B3
Oscillateur f-02 pour Générateur
f02 - OSCILLATOR
FOR FREQUENCY GENERATOR
f02 - Oszillator
für Frequenzgeber S45034-G2021
SIEMENS & HALSKE
S45035-G5014-B701-*-7402


Stützpunkt
C42195-Z5-C10
1) nicht im Raster
2) Prüffeldabgleich
L1
L2
L3
Ts1
Ts2
Ts3
Ts4
Ts5
Ü1
S45035-G5015-U1
Oscillateur pour Générateur
S45034-G2021
OSCILLATOR
FOR FREQUENCY GENERATOR
Oszillator
für Frequenzgeber S45034-G2021
SIEMENS
S45035-G5015-A711-*-7402
6-19


1) Auflagefläche! 8mm Ø frei von Lötzinnanhäufung
3) Abstand > 1mm
102
Formdraht (S45035-G5016-T1)
B1 W41251-W6178-B50
4) nicht im Raster
G5016-U1
Gr 6
Ts10
5) 109
21 114
Partie régulation pour Générateur S45034-G2021
Regelteil und Anzeigekreis
REGULATING SECTION AND INDICATING CIRCUIT
für G2021
SIEMENS
AKTIENGESELLSCHAFT
Bereich Weitverkehrstechnik
S45035-G5016-A711-*-7402

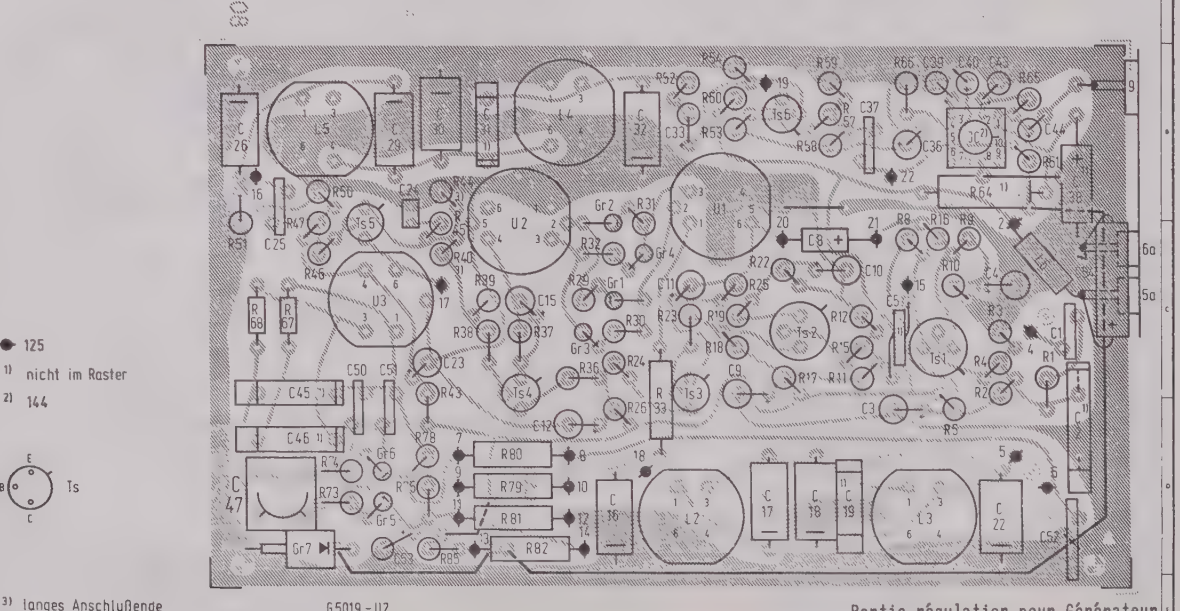

G5018-B711
G5019-B711
Oscillateur f3 pour Générateur S45034-G2021
f3-OSCILLATOR
f3-Oszillator
für G2021
SIEMENS AG
Werneuwerk für Weitverkehrs- und Kabeltechnik
S45035-G5017-B711-*-7402
6-20


L2
1) mit UHU-Plus, verdickt mit Aerosil, (max 0,1% der Klebermenge) ankleben Wicklung frei von Klebstoff.
nach dem Schwallen festschrauben
2) nicht im Raster
G5018-U2
Sk lfd Nr 140

Oszillator Oscillateur für G2021
OSCILLATOR

SIEMENS
Bereich Weitverkehrstechnik

S45035-G5018-B711-*-7402



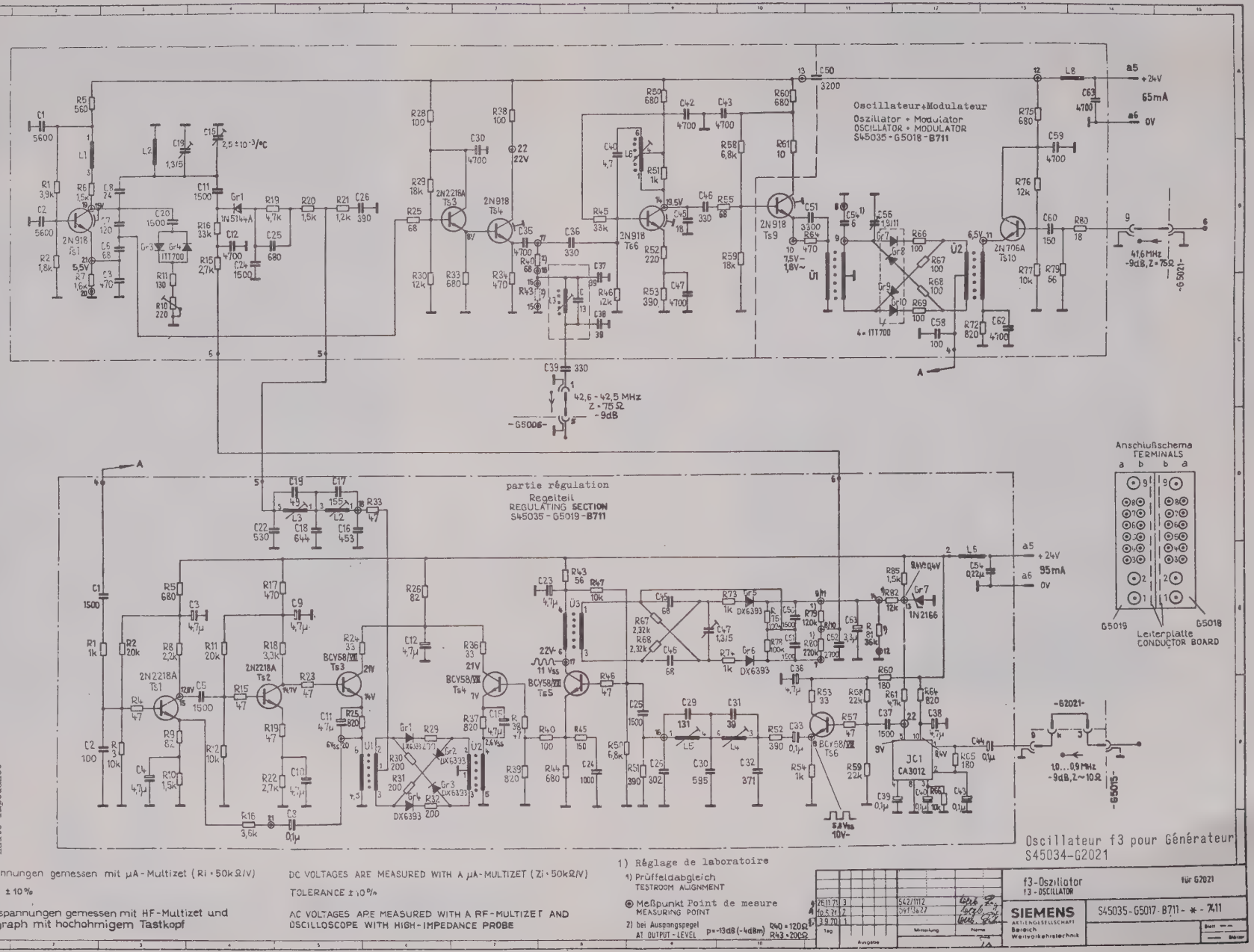
Partie régulation pour Générateur S45034-G2021

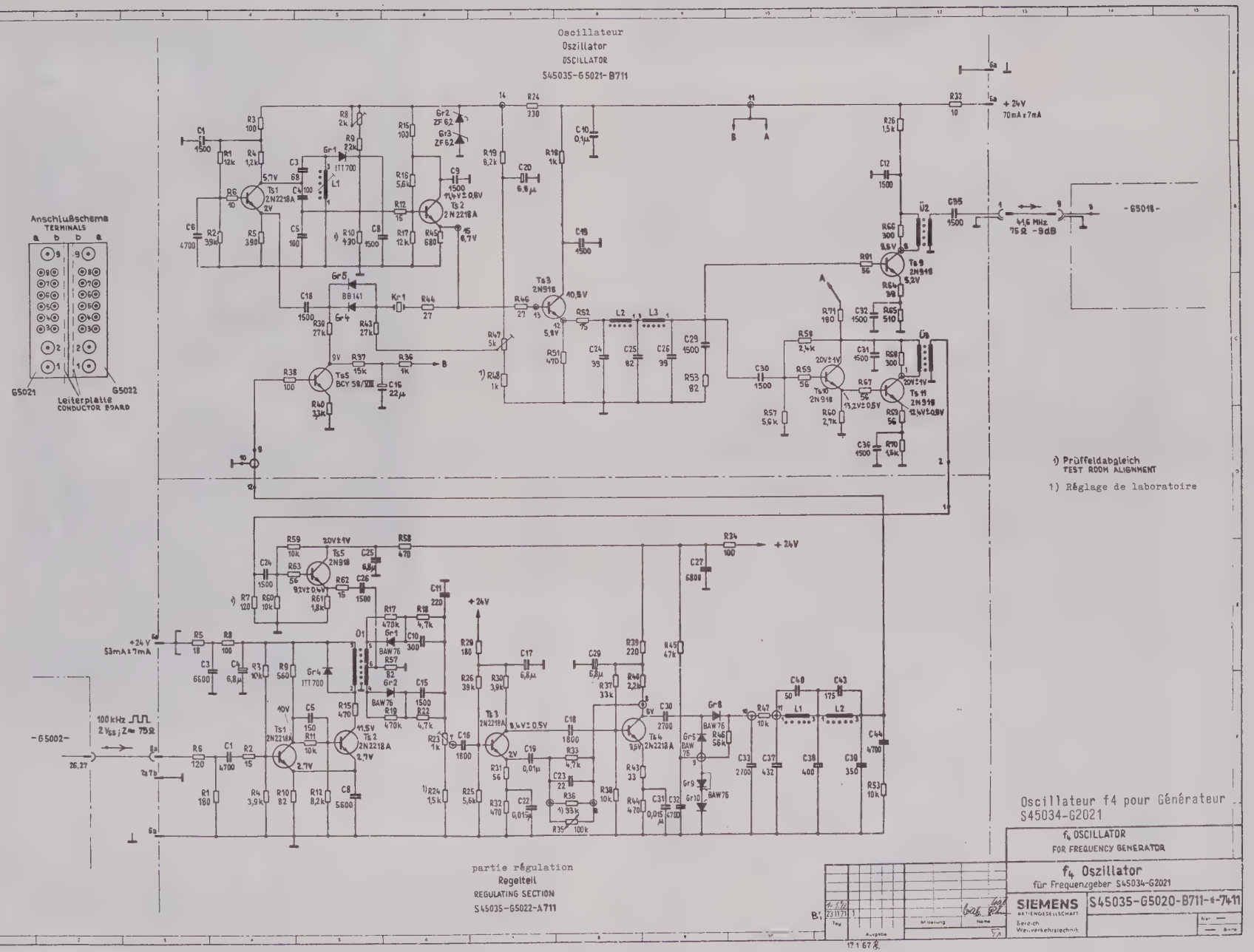
Regelteil
REGULATING SECTION
für G2021

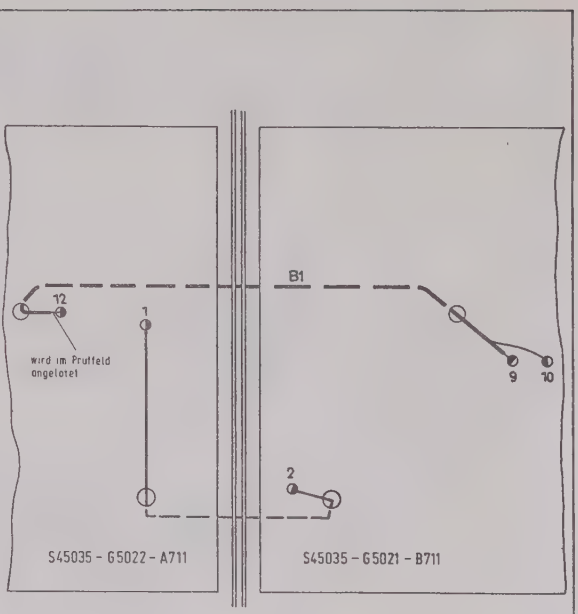
SIEMENS
Bereich Weitverkehrstechnik

S45035-G5019-B711-*-7402

6-22


Oscillateur+Modulateur
Oszillator + Modulator
OSCILLATOR + MODULATOR
S45035-G5018-B711
partie régulation
Regelteil
REGULATING SECTION
S45035-G5019-B711
Anschlußschema
TERMINALS
Leiterplatte
CONDUCTOR BOARD
G5019
G5018
Oscillateur f3 pour Générateur
S45034-G2021
courants continus mesurés avec µA-Multizet (Ri ≥50 kΩ/V) Tolérance ±10 %
tensions alternatives mesurées avec Multizet HF et Oscilloscope avec probe haute impédance
Gleichspannungen gemessen mit µA-Multizet (Ri ≥50kΩ/V)
Toleranz ±10%
Wechselspannungen gemessen mit HF-Multizet und Oszillograph mit hochohmigem Tastkopf
DC VOLTAGES ARE MEASURED WITH A µA-MULTIZET (Zi ≥50kΩ/V)
TOLERANCE ±10%
AC VOLTAGES ARE MEASURED WITH A RF-MULTIZET AND OSCILLOSCOPE WITH HIGH-IMPEDANCE PROBE
1) Réglage de laboratoire
1) Prüffeldabgleich
TESTROOM ALIGNMENT
Meßpunkt Point de mesure
MEASURING POINT
2) bei Ausgangspegel
AT OUTPUT-LEVEL
p=-13dB(-4dBm)
R40 = 120Ω
R43 = 200Ω
f3-Oszillator
f3 - OSCILLATOR
für G2021
SIEMENS
S45035-G5017-B711-*-7411


Oscillateur
Oszillator
OSCILLATOR
S45035-G5021-B711
Anschlußschema
TERMINALS
G5021
G5022
Leiterplatte
CONDUCTOR BOARD
+24V
70mA ± 7mA
10,7 MHz
75 Ω -9dB
-G5018-
1) Prüffeldabgleich
TEST ROOM ALIGNMENT
1) Réglage de laboratoire
+24 V
53mA ± 7mA
100 kHz
2 Vss ; Z≈ 75Ω
-G5002-
partie régulation
Regelteil
REGULATING SECTION
S45035-G5022-A711
Oscillateur f4 pour Générateur
S45034-G2021
f4 OSCILLATOR
FOR FREQUENCY GENERATOR
f4 Oszillator
für Frequenzgeber S45034-G2021
SIEMENS
S45035-G5020-B711-*-7411



Formdraht (S45035-G 5020-T1)

Oscillateur f4 pour Générateur S45034-G2021

f4-OSCILLATOR FOR FREQUENCY GENERATOR

f4-Oszillator für Frequenzgeber S45034-G2021

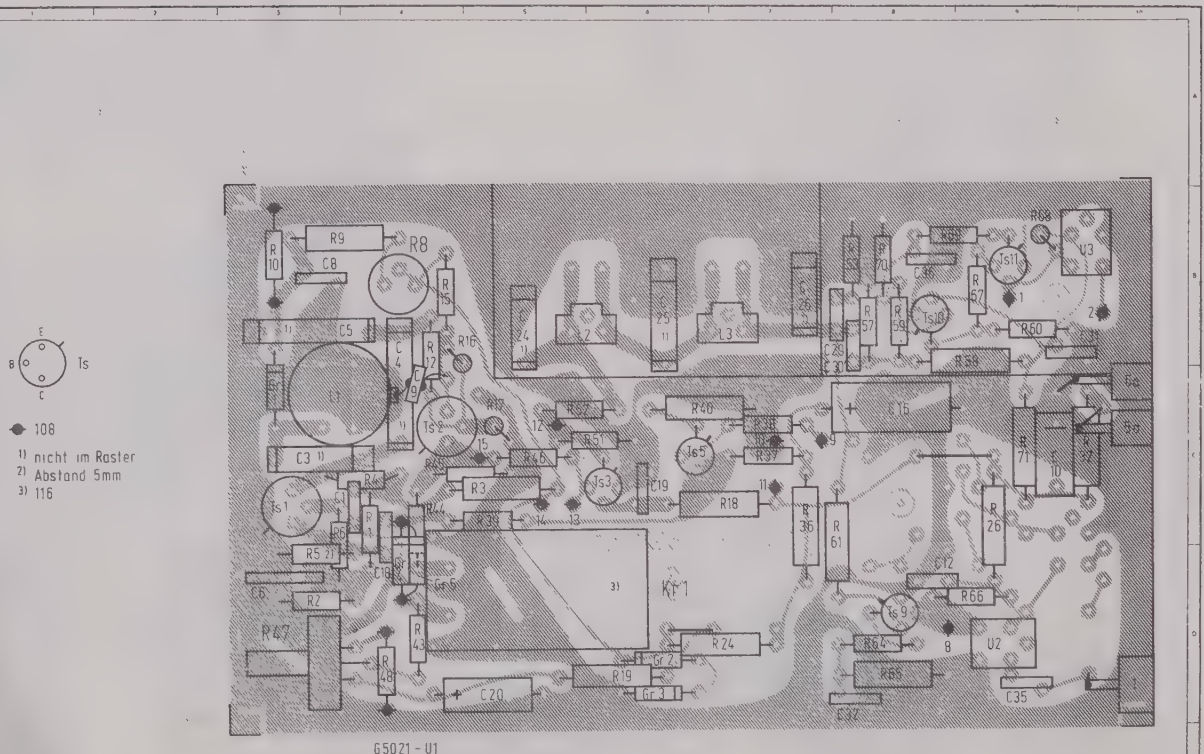
SIEMENS AKTIENGESELLSCHAFT Bereich Wehrverkehrstechnik

S45035-G5020-B711-*-7402

Blatt — Blätter —

B1 23171.1 Tag Ausgabe Änderung Name 72.

6.3.67 Hbl



G5021 - U1

Oszillator Oscillateur für G2021

SIEMENS AKTIENGESELLSCHAFT Bereich Wehrverkehrstechnik

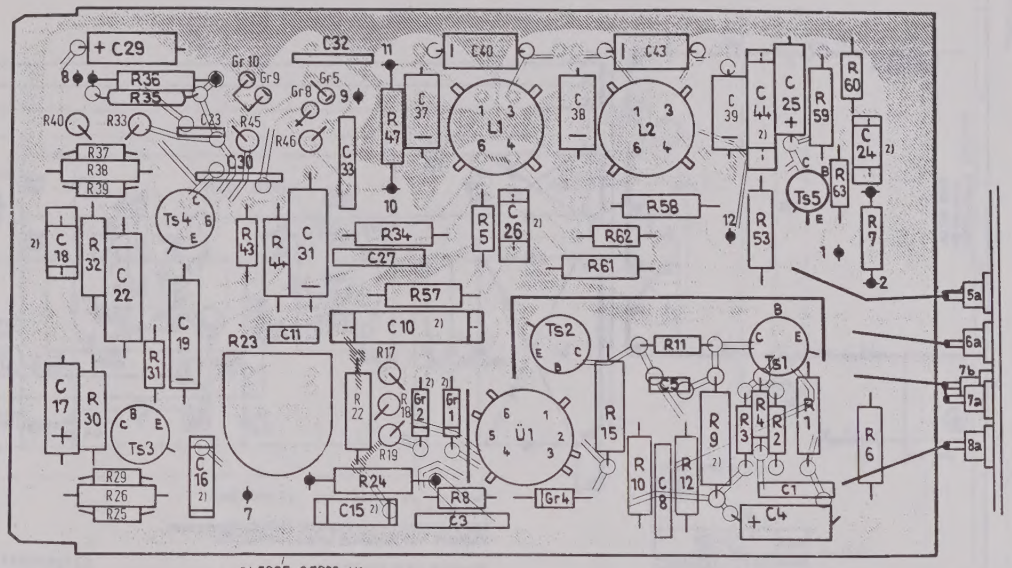
S45035 - G5021 - B711 - * - 7402

6-24

Blatt — Blätter —

72.5.72.2 23171.1 Tag Ausgabe 5421/1400 Änderung Name

72.



S45035-G5022-U1

Partie régulation pour Générateur S45034-G2021

REGULATING SECTION FOR FREQUENCY GENERATOR

Regelteil für Frequenzgeber S45035-G2021

● 105

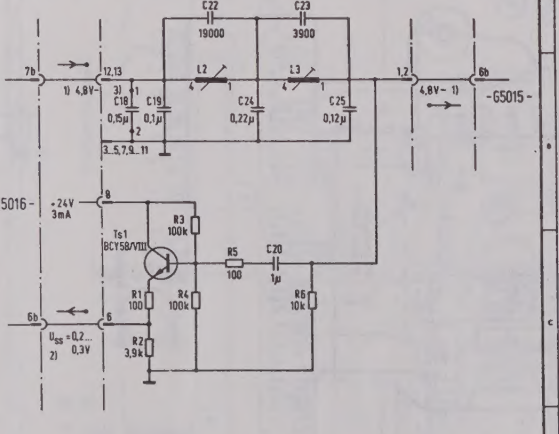
2) nicht im Raster

26.11.71 2	542/1112		
3.9.70 1			

SIEMENS AKTIENGESELLSCHAFT Bereich Weitverkehrstechnik

S45035-G5022-A711-*-7402

Tensions mesurées avec oscillateur non verrouillé
1) Quand f_{02} = 950 kHz ±3 Hz
2) Quand f_{02} = 950,480 kHz ±3 Hz
Mesuré avec oscilloscope
Tolérance des indications de tension ±5 %
3) Réglage de labo



Spannungen gemessen bei nicht gerastertem Oszillator
1) bei f_{02} = 950 kHz ± 3Hz gemessen mit µA-Multizet (Ri = 50kΩ/V)
2) bei f_{02} = 950,480 kHz ± 3Hz gemessen mit Oszillograph
Toleranz der Spannungsangaben ±5%

VOLTAGES ARE MEASURED WHEN f_{02} OSCILLATOR UNLOCKED
1) AT f_{02} = 950 kHz ± 3Hz MEASURED WITH µA-MULTIZET (Zi = 50kΩ/V)
2) AT f_{02} = 950,480 kHz ± 3Hz MEASURED WITH OSCILLOSCOPE
TOLERANCE OF THE VOLTAGE INDICATIONS ±5%

3) Prüffeldabgleich / TEST ROOM ALIGNMENT

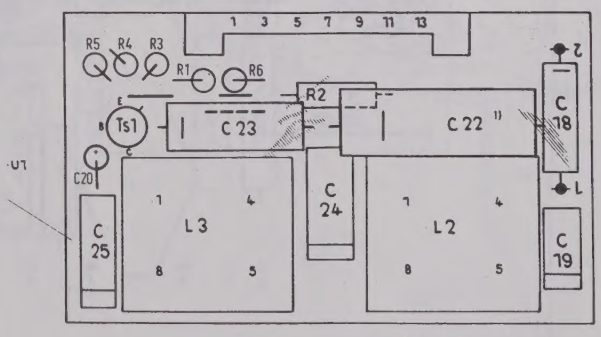
Filtre passe bas 500 Hz pour Générateur S45034-G2021

500-Hz-Tiefpaß für G2021
500 Hz-LOW-PASS FILTER

SIEMENS AG Werneruerk für Weitverkehrs- und Kabeltechnik

S45035-G5023-A711-*-7411

3.9.70 1 Tag Ausgabe Mitzeichnung Name Blatt — — Blätter



Filtre passe bas 500 Hz pour Générateur S45034-G2021

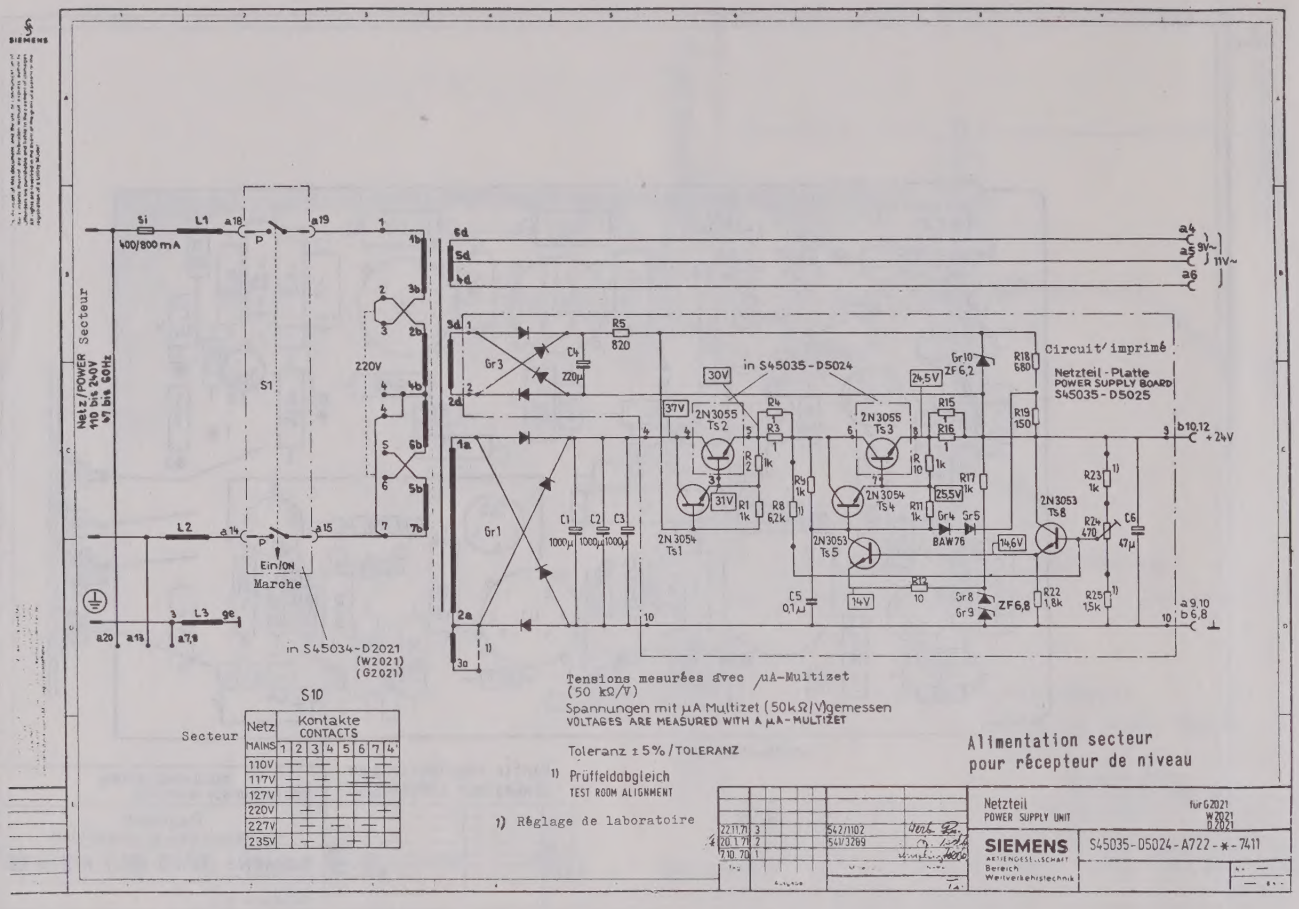
26.11.71 3	542/1112		
10.5.71 2	541/5003		
3.9.70 1			

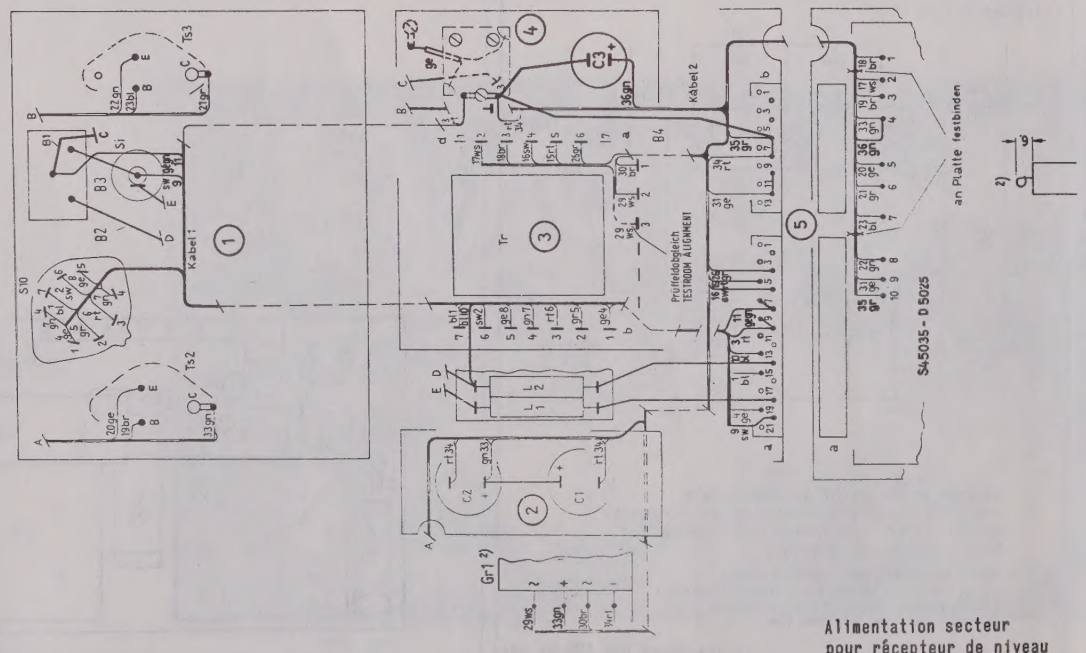
500-Hz-Tiefpaß für G2021
500 C/S LOW-PASS FILTER

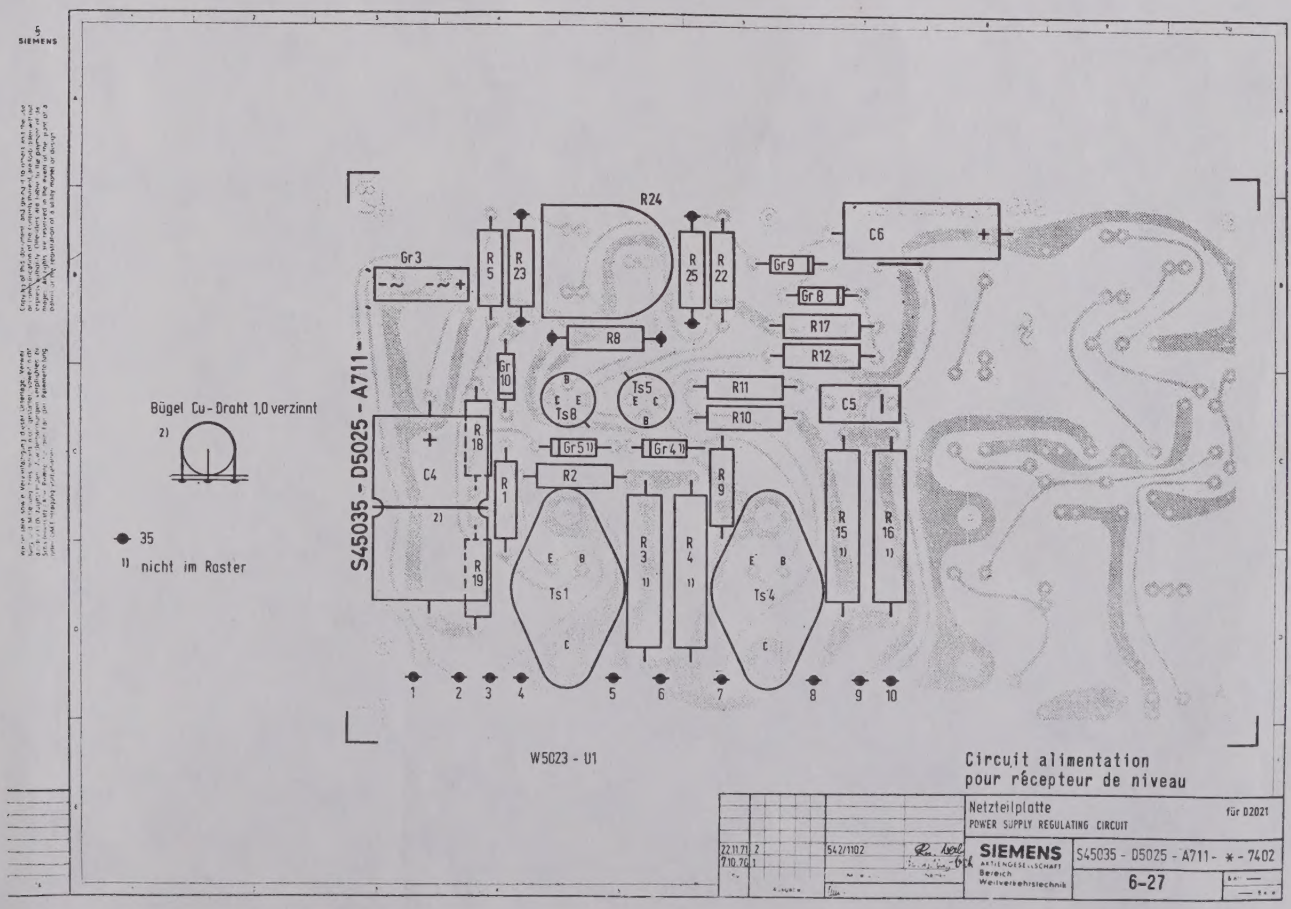
SIEMENS AKTIENGESELLSCHAFT Bereich Weitverkehrstechnik

S45035-G5023-A711-*-7402

6-25


Netz/POWER Secteur
110 bis 240V
50 bis 60Hz
400/800 mA
Si
L1
L2
L3
S1
220V
Ein/ON
Marche
in S45034-D2021
(W2021)
(G2021)
Circuit imprimé
Netzteil-Platte
POWER SUPPLY BOARD
S45035-D5025
in S45035-D5024
Gr1
Gr3
Gr4 Gr5 BAW76
Gr8 Gr9 ZF6,8
Gr10 ZF6,2
2N3055 Ts2
2N3055 Ts3
2N3054 Ts1
2N3054 Ts4
2N3053 Ts5
2N3053 Ts8
30V
37V
31V
24,5V
25,5V
14,6V
14V
+24V
S10
Secteur
Netz
Kontakte
CONTACTS
MAINS
110V
117V
127V
220V
227V
235V
Tensions mesurées avec µA-Multizet
(50 kΩ/V)
Spannungen mit µA Multizet (50kΩ/V)gemessen
VOLTAGES ARE MEASURED WITH A µA-MULTIZET
Toleranz ± 5% / TOLERANZ
1) Prüffeldabgleich
TEST ROOM ALIGNMENT
1) Réglage de laboratoire
Alimentation secteur
pour récepteur de niveau
Netzteil
POWER SUPPLY UNIT
für G2021
W2021
D2021
SIEMENS
AKTIENGESELLSCHAFT
Bereich
Weiterentwicklung
S45035-D5024-A722-*-7411


Kabel 1
Kabel 2
Tr
Prüffeldabgleich
TEST ROOM ALIGNMENT
S10
Ts1
Ts2
Ts3
C1
C2
Gr1 2)
an Platte festbinden
S45035-D5025
Alimentation secteur
pour récepteur de niveau
Netzteil
POWER SUPPLY UNIT
für G2021
W2021
D2021
SIEMENS
AKTIENGESELLSCHAFT
Bereich
Weiterentwicklung
S45035-D5024-A722-*-7402
6-26


S45035 - D5025 - A711 -
Gr3
R24
R5
R23
R25
R22
C6
Gr9
Gr8
R17
R12
R8
Gr10
Ts8
Ts5
R11
R10
C5
C4
R18
Gr5 1)
Gr4 1)
R2
R1
R9
R19
Ts1
R3 1)
R4 1)
Ts4
R15 1)
R16 1)
1 2 3 4 5 6 7 8 9 10
Bügel Cu-Draht 1,0 verzinnt
2)
35
1) nicht im Raster
W5023 - U1
Circuit alimentation
pour récepteur de niveau
Netzteilplatte
POWER SUPPLY REGULATING CIRCUIT
für D2021
SIEMENS
AKTIENGESELLSCHAFT
Bereich
Weitverkehrstechnik
S45035 - D5025 - A711 - * - 7402
6-27